United States Department of Agriculture

Natural Resources Conservation Service and Forest Service

In cooperation with Michigan Department of Agriculture, Michigan Agricultural Experiment Station, Cooperative Extension Service, and Michigan Technological University

Soil Survey of Iron County, Michigan



How To Use This Soil Survey

General Soil Map

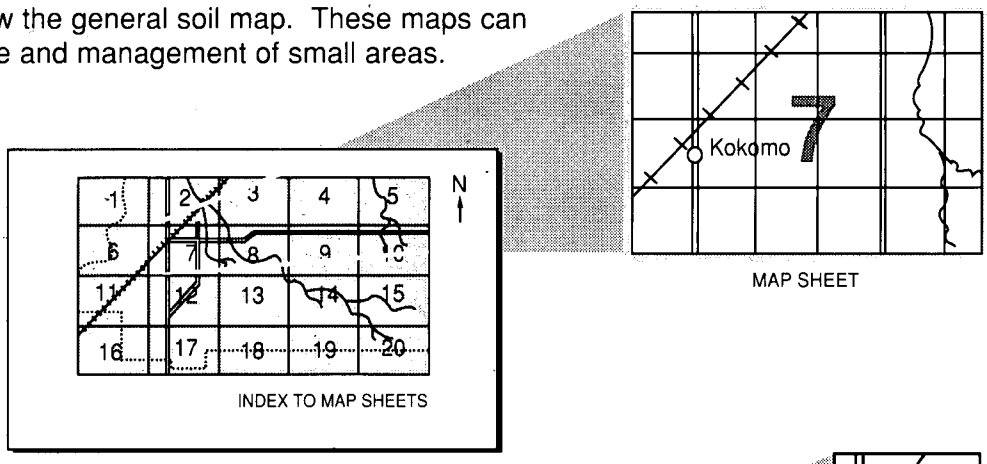
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

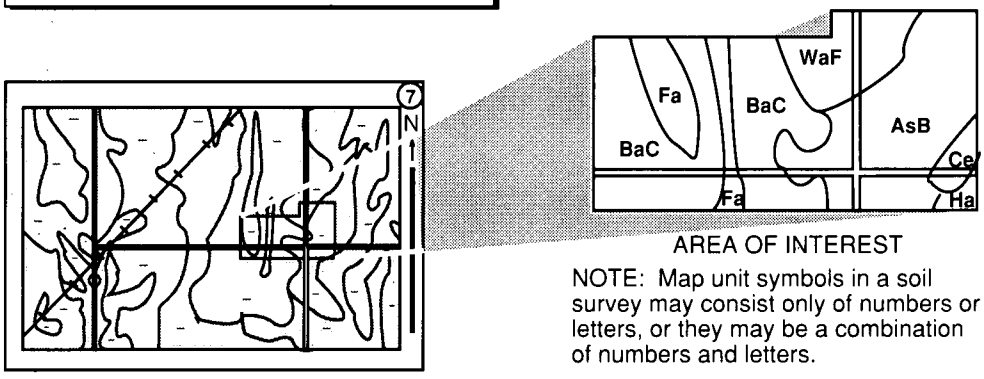
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service, the Forest Service, the Michigan Department of Agriculture, the Michigan Agricultural Experiment Station, the Cooperative Extension Service, and the Michigan Technological University. It is part of the technical assistance furnished to the Iron Soil and Water Conservation District. The Iron County Board of Commissioners provided financial assistance.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Horserace Rapids on the Paint River.

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Foreword

This soil survey contains information that can be used in land-planning programs in Iron County, Michigan. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Carole Jett
State Conservationist
Natural Resources Conservation Service

Soil Survey of Iron County, Michigan

By Lyle H. Linsemier, Natural Resources Conservation Service

Fieldwork by Lawrence Carey, Lyle H. Linsemier, and Kenneth Wikgren, Natural Resources Conservation Service; David White, Michigan Department of Agriculture; and Theressa L. Gallagher, Robert W. Griffith, Frank W. Hahnenberg, James K. Jordan, Philip D. Manor, and David A. Shadis, Forest Service

United States Department of Agriculture, Natural Resources Conservation Service and Forest Service,
in cooperation with
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IRON COUNTY is in the southwestern part of the Upper Peninsula of Michigan (fig. 1). The county is bordered on the east by Dickinson and Marquette Counties, on the north by Baraga and Houghton Counties, on the west by Ontonagon and Gogebic Counties, and on the south by the State of Wisconsin. Iron County has a total area of 744,371 acres, or about 1,163 square miles. In 1990, it had a population of 13,175.

This survey updates an earlier survey of Iron County published in 1937 (USDA, 1937). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about the county. It describes climate, physiography, streams and lakes, history and development, farming, and transportation facilities and employment.

Climate

Prepared by the Michigan Department of Agriculture, Environmental Division, Climatology Section.

The climate in Iron County is highly varied because of topographical variations and the proximity of the county to inland lakes. Table 1 gives data on temperature and precipitation for the survey area as recorded at Beechwood, Crystal Falls, and Stambaugh. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 14.3 degrees F at Beechwood, 11.6 degrees at Crystal Falls, and 14.6 degrees at Stambaugh. The average daily minimum temperature is 4.5 degrees at Beechwood and 4.1 degrees at Stambaugh. The lowest temperature on record was -36 degrees at Beechwood on January 17, 1982, and -47 degrees at Stambaugh on February 10, 1899. In summer, the average temperature is 63.4 degrees at Beechwood, 62 degrees at Crystal Falls, and 63.2 degrees at Stambaugh. The highest recorded temperature was 96 degrees at Beechwood on June 19, 1988, and 103 degrees at Stambaugh on July 13, 1936.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degrees days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

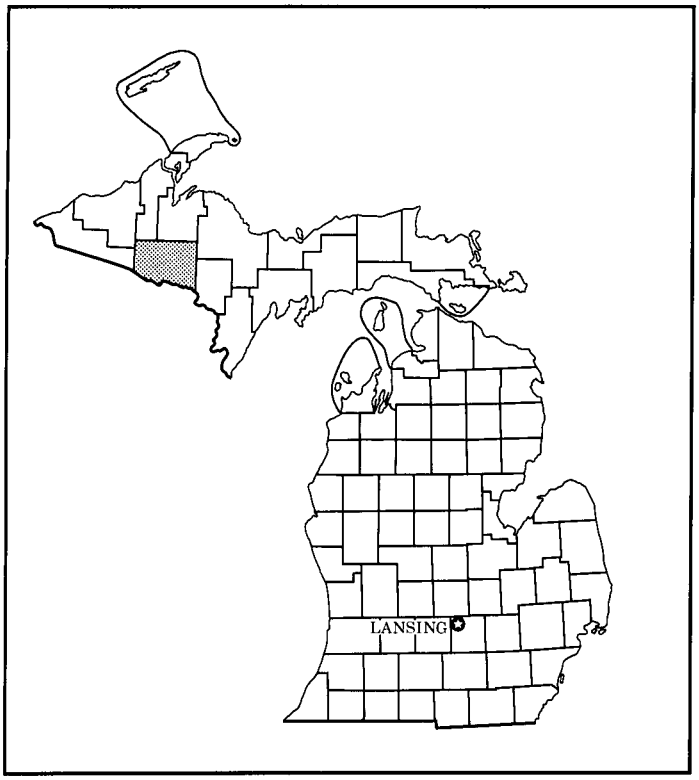


Figure 1.—Location of Iron County in Michigan.

The total annual precipitation is 33.63 inches at Beechwood, 29.92 inches at Crystal Falls, and 31.68 inches at Stambaugh. Of the total precipitation, 22.52 inches, or 67 percent, usually falls in April through September at Beechwood. About 20.30 inches, or 68 percent, falls during this period at Crystal Falls, and 21.87 inches, or 69 percent, falls during this period at Stambaugh. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17.99 inches at Beechwood, 16.73 inches at Crystal Falls, and 18.33 inches at Stambaugh. The heaviest 1-day rainfall during the period of record was 4.03 inches at Beechwood, 3.50 inches at Crystal Falls, and 4.44 inches at Stambaugh. Thunderstorms occur on about 33 days each year, and most occur in July.

The average seasonal snowfall is 106.3 inches at Beechwood, 70.8 inches at Crystal Falls, and 76.9 inches at Stambaugh. The greatest snow depth at any one time during the period of record was 39 inches at Beechwood, 47 inches at Crystal Falls, and 53 inches at Stambaugh. On the average, 150 days of the year at Beechwood, 143 days of the year at Crystal Falls, and 132 days of the year at Stambaugh have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The heaviest 1-day snowfall on record was 18.2 inches at Beechwood, 18.0 inches at Crystal Falls, and 16.2 inches at Stambaugh. The greatest monthly snowfall was 63.2 inches in December 1968 at Beechwood, 53.4 inches in March 1939 at Crystal Falls, and 39 inches in March 1917 at Stambaugh. The greatest seasonal snowfall was 139.6 inches in 1968-69 at Beechwood, 143.2 inches in 1942-43 at Crystal Falls, and 113.7 inches in 1959-60 at Stambaugh. The smallest seasonal snowfall was 62.9 inches in 1986-87 at Beechwood, 31.6 inches in 1963-64 at Crystal Falls, and 28.5 inches in 1902-03 at Stambaugh.

Based on data recorded at the National Weather Service Office at Green Bay Airport, the average relative humidity at 1 p.m. is about 63 percent. Humidity is higher at night, and the average at 7 a.m. is about 82 percent. The sun shines 65 percent of the time possible in summer and 47 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11.4 miles per hour, in April.

Physiography

Iron County is part of a high plateau region. Elevation ranges from about 1,285 to 1,875 feet above sea level. The physiography of the county is the result of continental glaciation, modified in some areas by bedrock. Glacial landforms include rolling ground moraines, end moraines, steep ice-contact features, and outwash plains.

The major bedrock types in the county are Middle Precambrian. They are dominantly the Michigamme slate and associated formations including graywacke, greenstone, and quartzite deposits. Extensive iron formations are near the area around Iron River and Crystal Falls. Lower Precambrian rocks, chiefly Algoman and Laurentian granite and granite gneiss, occur in the eastern part of Iron County.

Outcrops of bedrock are throughout the county, but most areas are covered with glacial drift as much as 200 feet thick. The surficial glacial deposits in Iron County are all of late Wisconsinan Age. They were deposited primarily by the Langlade, Ontonagon, Keweenaw Bay, Green Bay, and Michigamme lobes of the Woodfordian and Valders advances (Peterson, 1985). Subsequent ablation of the glacier, glacial meltwater, and postglacial activity greatly modified these deposits.

The lineated topography characterized by drumlins and intervening grooves in southwestern Iron County is a ground moraine deposited by the Langlade lobe. The

drumlins are oriented northeast-southwest and are typically 0.5 to 1.0 mile long, 0.3 to 0.5 mile wide, and 50 to 150 feet high. The grooves at the lower altitudes tend to contain deposits of outwash and ice-contact stratified sand and gravelly sand. Swamps and lakes are in linear depressions adjacent to the drumlins.

The Winegar moraine is a major end moraine system in northwestern and north-central Iron County. It was deposited by the Keweenaw Bay lobe to the east and by the Ontonagon lobe to the west. The moraine consists of a hummocky topography of drumlins and bedrock knolls with many swampy enclosed depressions and a few lakes.

Two end moraines deposited by the Green Bay lobe occur in southeastern Iron County. The moraine south of Crystal Falls consists of bedrock hills with a thin veneer of drift. The Sagola moraine forms a narrow hummocky ridge along the Dickinson County line.

The ground moraine in northeastern Iron County was deposited by the Langlade, Keweenaw Bay, and Michigamme lobes. The topography consists of low ridges of thin drift over bedrock surrounded by poorly drained, flat topography.

Kettle-kame topography is common throughout the region, especially in eastern Iron County. The topography is characterized by steep ridges, kettle lakes, kame terraces, eskers, crevasse fillings, pitted outwash, and poorly drained depressions. The areas consist primarily of ice-contact stratified drift deposited as the glacial ice melted.

A large outwash plain is in eastern Iron County. The topography in this area consists of steep, pitted outwash and broad, flat sand plains. The pitted outwash is characterized by bogs and swamps as well as sand ridges. The Panola plain south of Crystal Falls is an example of a flat outwash plain.

The glacial deposits in Iron County have been modified by postglacial activity. The forces of water and wind erosion were most dramatic during the period after the glaciers were gone and before revegetation of the landscape. Alluvial and lacustrine deposits occur in areas that were flooded by the water of streams and lakes. Eolian deposits include sand dunes and the silty cap that covers most of the glacial deposits in the region. Organic deposits occur in bogs and swamps throughout the county.

Streams and Lakes

Iron County has more than 900 miles of streams and rivers and more than 1,000 lakes and ponds. The major rivers are the Paint, Net, Hemlock, Fence, Deer, Michigamme, Iron, Brule, and Menominee Rivers.

The Net, Hemlock, and Paint Rivers and their many tributaries drain the central and western parts of Iron County. The Fence, Deer, and Michigamme Rivers drain the eastern part. The Iron and Brule Rivers drain the southwestern part. The Brule River, for nearly its entire length, forms the boundary between Michigan and Wisconsin. The Paint, Michigamme, and Brule Rivers converge in southeastern Iron County to form the Menominee River, which divides Michigan and Wisconsin and eventually flows into Green Bay. A few rivers in northwestern Iron County, including the Perch River and the East Branch of the Ontonagon River, flow northward to Lake Superior.

There are several hydroelectric dams on the Michigamme and Paint Rivers. The Michigamme Reservoir and Peavy Pond are two large impoundments on the Michigamme River.

Iron County has many natural lakes and ponds. The largest of these are Perch Lake in the northern part of the county and Smoky, Hagerman, Sunset, and Chicagon Lakes in the southern part.

History and Development

In 1846, a survey crew led by William Burt noted abnormal compass readings on the Paint River near the site that is now Crystal Falls. In 1851, a U.S. land surveyor noted an outcrop of iron ore 5 feet high near the site that is now Stambaugh. These findings became known as the western deposits of the Menominee Iron Range. By 1875, prospectors and developers were making numerous excursions into the wilderness of the western Menominee Range. By the time the Chicago and Northwestern Railway reached the eastern Menominee Range in 1882, active mines had mined more than 74,000 tons of iron ore (Reiman, 1951).

The influx of miners along the western Menominee Range sparked a movement to establish a new county from the area that made up the western townships of Marquette County. Despite the objections of the Marquette County Board of Supervisors, Iron County was established in September 1885. Crystal Falls was chosen as the county seat.

As iron mining continued to grow steadily, the lumber industry grew to become the county's second most important industry. During the winter of 1895-96, loggers in Amasa cut and floated more than 87 million board feet of pine to the sawmills at the mouth of the Menominee River. After the turn of the century, hardwoods dominated the lumber industry.

Mining in Iron County peaked in 1920, but its decline was gradual. In 1939, the county's 11 mines employed 1,000 people. In 1954, 15 iron mines, employing approximately 2,000 workers, shipped more than $22 million in iron ore. In 1956, the county's 3 remaining

mines, the Bristol at Crystal Falls and the Homer-Wauseca and Sherwood at Iron River, produced a combined total of 2.4 million tons of iron ore and employed 700 people. The Sherwood, Iron County's last active mine, closed in 1978 (Reiman, 1951).

Farming

Agriculture plays a minor role in the economy of Iron County. Iron County ranked sixth in the state in total land area and fourth in individual farm size in 1989, but it ranked 72nd in agricultural production. Factors that limit the acreage used for crop production are the short growing season, the limited local markets, and the stony soil conditions in many of the upland areas.

Typically, farms in Iron County are about 40 percent woodland. They average about 300 acres in size. In 1989, the county had about 29,000 acres of farmland. Of this total, about 13,000 acres was cropland (Michigan Department of Agriculture, 1990). Oats were grown on about 1,200 acres, potatoes on 600 acres, wheat on 100 acres, and barley on 100 acres. The main soils in the county that are used for crops are Oconto, Stambaugh, Sundog, Padus, Sarona, and Wabeno soils. Dairy cattle, beef cattle, and potatoes are the main agricultural products in Iron County. In 1989, Iron County had about 2,200 cattle and calves, including 300 milk cows and 1,000 beef cattle (Michigan Department of Agriculture, 1990).

Iron County's most notable agricultural undertaking was the Triangle Ranch, which began operation in 1920 northwest of Amasa. The Triangle Ranch raised beef cattle in cutover areas of Sundog soils. The owners also operated a beaver farm, produced maple syrup, raised chickens and dairy cows, and opened a dude ranch. Today much of the ranch is used for pine and spruce plantations, and the remaining areas of open land are used as hayland (Michigan History Magazine, 1984).

Transportation Facilities and Employment

The main roads in the county are U.S. Highways 2 and 141 and State Highways 69, 73, and 189. Two small airports serve the county. The town of Amasa is served by a railroad that passes through northeastern Iron County.

The major sources of employment in Iron County are small manufacturing facilities; sawmills; local, State, and Federal government; two hospitals and a medical care facility; tourism; pulpwood and timber cutting and hauling; and farming.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the boundaries on the detailed soil maps of Iron County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences are the result of modifications or refinements in soil series concepts, variations in the intensity of mapping, and variations in the extent of the soils in each survey area.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

The section "Survey Procedures" explains specific procedures used to make this survey.

Survey Procedures

The general procedures followed in making this survey are described in the National Soil Survey Handbook (USDA, 1983) of the Natural Resources Conservation Service. The U.S. Forest Service ecological classification system (Brenner and Jordan, 1991; Driscoll and others, 1984; Jordan, 1977 and 1982; Nelson and Jordan, 1987; Russell and Jordan, 1991) was used in conjunction with the handbook to prepare the soil survey on all private and public lands within the administrative boundary of the Ottawa National Forest. The map units on the Forest Service lands were designed differently from those in other parts of the survey area.

The ecological classification system is an integrated system that includes evaluation and classification of landscape areas. Ecological units are mapped on aerial photographs, and interpretations are made from inventory maps for use in managing forest land and resources. In this survey, map symbols 500B to 556 identify map units within the Ottawa National Forest.

Procedures for Map Units 50 to 168F

The soil survey maps made for conservation planning prior to the start of the project and the survey of Iron County published in 1937 (USDA, 1937) were among the references used in making this survey. Before the fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on 1:20,000 leaf-off aerial photographs. U.S. Geologic Survey topographic maps, at a scale of 1:24,000, were used to relate land and image features.

A reconnaissance was made by pickup truck before the soil scientists traversed the surface on foot. In areas where the soil pattern is very complex, traverses were spaced as closely as 200 yards. In areas where the soil pattern is relatively simple, traverses were about one-fourth mile apart.

As they traversed the surface, the soil scientists divided the landscape into segments. For example, a hillside was separated from a swale and a gently sloping ridgetop from a very steep side slope.

Observations of such items as landforms, blown-down trees, vegetation, and roadbanks were made without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 5 feet. The pedons described as typical were observed and studied in pits that were dug with shovels, mattocks, and digging bars.

Notes were taken on the composition of map units during each year of the project. These notes were supplemented by additional notes as mapping progressed and as the composition of individual map units was determined.

Samples for chemical and physical analyses were taken from representative sites of some soils in the survey area. The analyses were made by the Soil Research Laboratory, Michigan Technological University, Houghton, Michigan, and the Soil Survey Laboratory, Lincoln, Nebraska. The results of the studies can be obtained on request from the State office of the Natural Resources Conservation Service in East Lansing, Michigan.

After the completion of soil mapping on aerial photographs, map unit delineations were transferred by hand to another set of the same photographs. Cultural features were recorded from observations of the maps and the landscape.

Procedures for Map Units 500B to 556

Before ecological units were mapped, information about the climate, geology, soils, hydrology, and vegetation in the survey area was collected. Research techniques were used in mid and late successional stands to collect information on vegetative and soil components in areas on uplands. Soils were tentatively classified to an appropriate taxonomic level (USDA, 1975). The results were used in developing ecological map units that are defined on the basis of both abiotic and biotic landscape characteristics.

The initial map unit legend was field tested for 2 years, and all minor units were identified and described. The range in characteristics for ecological types was analyzed and documented. All studies, map unit development, and map unit legend were by land type associations.

Following field testing, field sheets were thoroughly examined by scanning stereoscope to delineate possible map units, select traverse locations, study historical disturbance features, learn past management activities, identify local glacial landforms, and establish vegetation history. Also, information from past onsite investigations and local research was incorporated and several scales, types, and times of other aerial photography were reviewed.

Mapping personnel traversed the landscape, evaluated all site factors, and determined and plotted ecological unit boundaries in the field. Some important characteristics used by the field personnel included glacial landforms, water table levels and other moisture regime characteristics, soil texture and color, interpretation of groups of vegetative species, and disturbance factors.

Typically, mappers inventoried 300 to 400 acres per day. They performed detailed evaluations and documented each observation on field sheet overlays; completed numerous field note cards; established and completed full soil descriptions; and analyzed landforms, vegetation plots, and hydrologic features on numerous transects. Descriptions of soil pedons and vegetation plots were developed from subsequent laboratory analysis of soil samples. The samples were taken from locations that were strategically selected for the examination of landscape features and the collection of data on overstory, understory, ground flora, forest floor, soil, substratum, and ground water for documenting ecological units. Numerous monitoring stations recording air temperature, soil temperature, water table levels, precipitation, and soil moisture were installed for a period of 5 years to further document

these ecological units. Specific procedures used by the Ottawa National Forest to execute the U.S. Forest Service Ecological Classification System may be further reviewed in Ottawa National Forest Supplements 1 through 5.

Soil profiles were described to a depth of 6 feet in all loamy till and clayey lacustrine deposits and to a depth of 10 to 15 feet in all sandy till, sandy outwash, and sandy lacustrine deposits. Soil properties and geological properties can affect ecological behavior at these depths (Hannah and Zahner, 1970).

Following field inventory, the final boundaries of the ecological units were drawn on the aerial photographs. The completed photography was checked for line closure and for matching of delineations across photographs.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Nearly Level, Very Poorly Drained, Mucky or Peaty Soils

These soils are used mainly as woodland. An equipment limitation and windthrow are the main management concerns.

1. Lupton-Cathro Association

Nearly level, very poorly drained, mucky soils on ground moraines, outwash plains, end moraines, and stream terraces

Areas of these soils are in depressions on ground moraines, outwash plains, end moraines, and stream terraces. Slopes range from 0 to 2 percent.

This association makes up about 0.8 percent of the county. It is about 40 percent Lupton and similar soils, 35 percent Cathro and similar soils, and 25 percent soils of minor extent.

Typically, the surface layer of the Lupton soils is black muck about 10 inches thick. The material below this to a depth of about 60 inches also is black muck.

Typically, the surface layer of the Cathro soils is black muck about 7 inches thick. Below this is black muck about 19 inches thick. The substratum to a depth of about 60 inches is dark gray and brown very fine sandy loam and fine sandy loam.

Of minor extent in this association are moderately well drained to somewhat excessively drained, nearly level to steep, mineral soils on knolls and ridges. The poorly drained Waucedah soils are adjacent to streams and are subject to frequent flooding.

This association is used mainly as woodland. The major management concerns are an equipment limitation and windthrow.

2. Greenwood-Merwin Association

Nearly level, very poorly drained, peaty soils on ground moraines, outwash plains, and end moraines

Areas of these soils are in depressions on ground moraines, outwash plains, and end moraines. Slopes are 0 to 1 percent.

This association makes up about 1.4 percent of the county. It is about 40 percent Greenwood and similar soils, 35 percent Merwin and similar soils, and 25 percent soils of minor extent.

Typically, the surface layer of the Greenwood soils is reddish brown peat about 5 inches thick. Below this to a depth of about 60 inches are layers of dark reddish brown and dark brown peat and dark reddish brown mucky peat and muck.

Typically, the surface layer of the Merwin soils is yellowish brown peat about 8 inches thick. Below this is dark reddish brown mucky peat about 24 inches thick. The substratum to a depth of about 60 inches is black silt loam and very dark grayish brown and brown sandy loam.

Of minor extent in this association are moderately well drained to somewhat excessively drained, nearly level to steep, mineral soils on knolls and ridges. The poorly drained Waucedah soils are adjacent to streams and are subject to frequent flooding.

This association is used mainly as woodland. The major management concerns are an equipment limitation and windthrow.

Nearly Level to Rolling, Excessively Drained, Sandy Soils

These soils are used mainly as woodland. Seedling mortality and an equipment limitation are the major management concerns.

3. Vilas Association

Nearly level to rolling, excessively drained, sandy soils on outwash plains

Areas of these soils are on outwash plains. Slopes range from 1 to 18 percent.

This association makes up about 1 percent of the county. It is about 70 percent Vilas and similar soils and 30 percent soils of minor extent.

Typically, the surface layer of the Vilas soils is dark reddish brown loamy sand about 4 inches thick. The subsurface layer is dark reddish gray loamy sand about 1 inch thick. The subsoil is about 19 inches thick. The upper part is dark reddish brown and dark brown, very friable loamy sand. The lower part is dark brown, loose sand. The substratum to a depth of about 60 inches is brown and light brown sand.

Of minor extent in this association are the somewhat excessively drained Karlin soils, the well drained Pence soils, and the very poorly drained Lupton and Greenwood soils. Karlin and Pence soils are less droughty than the Vilas soils. They are in landscape positions similar to those of the Vilas soils. Lupton and Greenwood soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are seedling mortality and an equipment limitation.

Nearly Level to Hilly, Excessively Drained to Well Drained, Loamy and Sandy Soils

These soils are used mainly as woodland. Seedling mortality and an equipment limitation are the major management concerns. Some of the soils are used as cropland. If cultivated crops are grown, water erosion and droughtiness are management concerns.

4. Karlin-Sarona-Vilas Association

Nearly level to hilly, excessively drained to well drained, loamy and sandy soils on ground moraines, end moraines, and outwash plains

Areas of these soils are on ground moraines, end moraines, and outwash plains. Slopes range from 1 to 35 percent.

This association makes up about 12.3 percent of the county. It is about 30 percent Karlin and similar soils, 20 percent Sarona and similar soils, 15 percent Vilas and similar soils, and 35 percent soils of minor extent (fig. 2).

The Karlin soils are somewhat excessively drained. Typically, the surface layer is black fine sandy loam about 2 inches thick. The subsurface layer is reddish gray fine sandy loam about 1 inch thick. The subsoil is about 32 inches thick. The upper part is brown, friable fine sandy loam. The lower part is brown and yellowish red, friable and very friable sandy loam and loamy sand. The substratum to a depth of about 60 inches is brown sand.

The Sarona soils are well drained. Typically, the surface layer is very dark gray fine sandy loam about 2 inches thick. The subsurface layer is brown fine sandy loam about 5 inches thick. The subsoil is about 30 inches thick. The upper part is dark brown and brown, friable fine sandy loam and loamy fine sand. The lower part is dark brown, friable loam. The substratum to a depth of about 60 inches is reddish brown gravelly sandy loam.

The Vilas soils are excessively drained. Typically, the surface layer is dark reddish brown loamy sand about 4 inches thick. The subsurface layer is dark reddish gray loamy sand about 1 inch thick. The subsoil is about 19 inches thick. The upper part is dark reddish brown and dark brown, very friable loamy sand. The lower part is dark brown, loose sand. The substratum to a depth of about 60 inches is brown and light brown sand.

Of minor extent in this association are the well drained Pence soils, the moderately well drained Wabeno soils, the somewhat poorly drained Au Gres and Channing soils, and the very poorly drained Lupton and Greenwood soils. Pence soils have a substratum of sand and gravelly sand. Wabeno soils have very firm layers in the subsoil that limit rooting depth. Pence and Wabeno soils are in landscape positions similar to those of the major soils. Au Gres and Channing soils are in drainageways and on low flats in the uplands. Lupton and Greenwood soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are seedling mortality in areas of the Vilas soils and an equipment limitation in areas of all the major soils.

Some areas are used as cropland. The major management concerns are droughtiness in areas of the Karlin and Vilas soils and water erosion in areas of all the major soils.

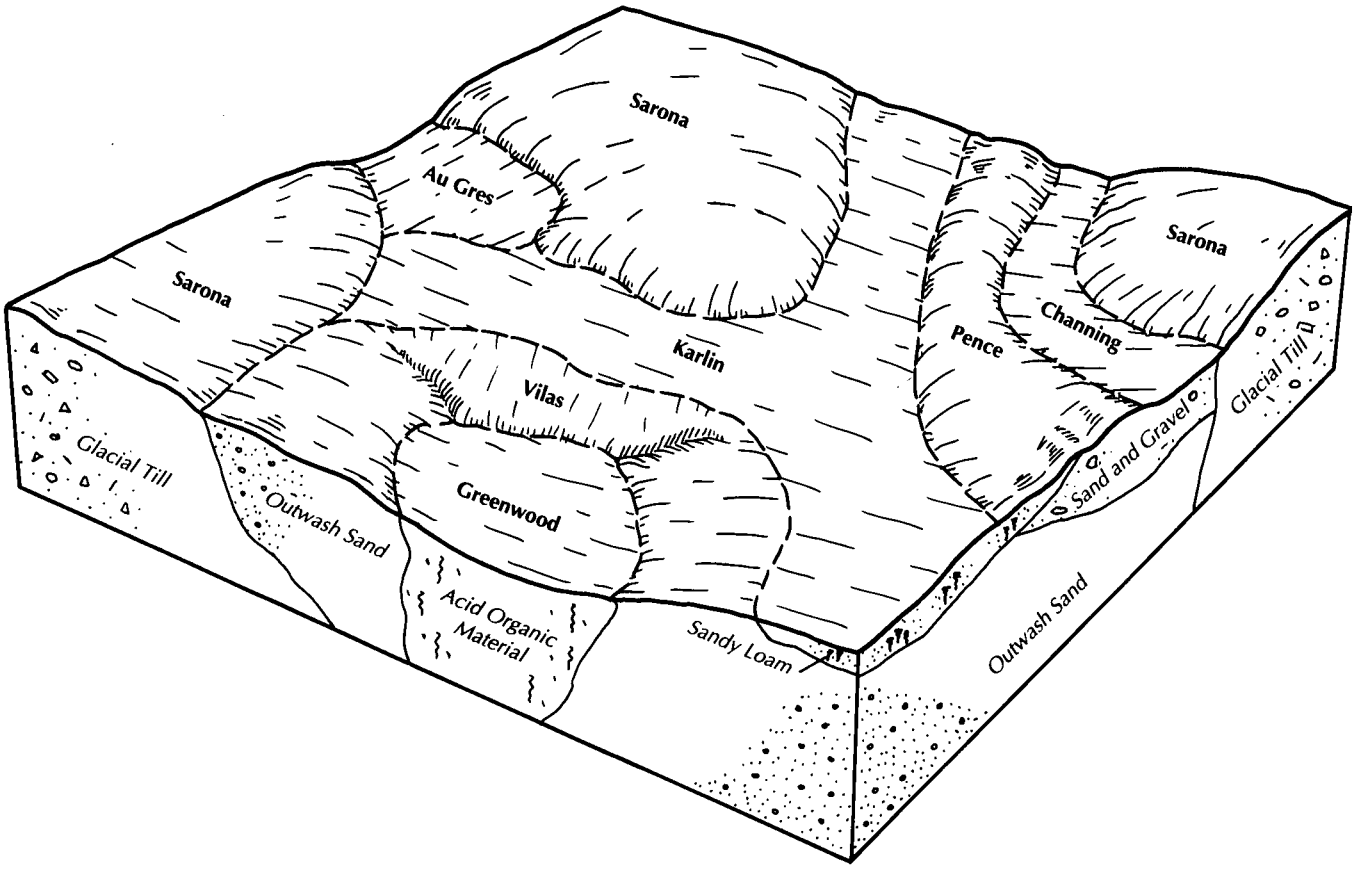


Figure 2.—Typical pattern of soils and parent material in the Karlin-Sarona-Vilas association.

5. Haplorthods Association

Nearly level to hilly, well drained, loamy and sandy soils on end moraines

Areas of these soils are on end moraines. Slopes range from 1 to 35 percent.

This association makes up about 9.1 percent of the county. It is about 65 percent Haplorthods and similar soils and 35 percent soils of minor extent.

Typically, the surface layer and subsoil of the Haplorthods are sandy, loamy, or sandy and loamy. The substratum is sand or sand and gravelly sand.

Of minor extent in this association are the somewhat excessively drained Karlin soils and Entic Haplorthods and areas of sandy soils; the well drained Pence soils and Entic Haplorthods and areas of sandy-skeletal soils; and the moderately well drained Gogebic soils. All of these minor soils are in positions on the landscape similar to those of the Haplorthods. Also of minor extent are the somewhat poorly drained Haplaquods and the poorly drained, nonacid Humaquepts in drainageways and on low flats on uplands and the very poorly drained Borohemists-Borosaprists, acid, and Borosaprists-Histic Humaquepts, nonacid, complexes in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation and erosion.

Nearly Level to Hilly, Well Drained and Very Poorly Drained, Loamy and Mucky Soils

These soils are used mainly as woodland. An equipment limitation and windthrow are the major management concerns. Some areas are used as cropland. If cultivated crops are grown, water erosion is a management concern.

6. Sagola-Trenary-Cathro Association

Nearly level to hilly, well drained and very poorly drained, loamy and mucky soils on ground moraines and end moraines

Areas of these soils are in depressions and on

ground moraines and end moraines. Slopes range from 0 to 35 percent.

This association makes up about 1 percent of the county. It is about 40 percent Sagola and similar soils, 15 percent Trenary and similar soils, 10 percent Cathro and similar soils, and 35 percent soils of minor extent.

The Sagola soils are in nearly level to hilly areas and are well drained. Typically, the surface layer is black fine sandy loam about 1 inch thick. The subsurface layer is reddish gray fine sandy loam about 6 inches thick. The subsoil is about 40 inches thick. The upper part is reddish brown, friable fine sandy loam. The next part is brown and dark brown, friable fine sandy loam. The lower part is dark reddish brown and reddish brown, firm fine sandy loam and loamy fine sand. The substratum to a depth of about 60 inches is reddish brown loamy fine sand.

The Trenary soils are in nearly level to rolling areas and are well drained. Typically, the surface layer is black fine sandy loam about 4 inches thick. The subsurface layer is brown fine sandy loam about 1 inch thick. The subsoil is about 31 inches thick. The upper part is dark brown, friable fine sandy loam. The next part is dark reddish brown and reddish brown, firm sandy loam and loamy sand. The lower part is dark reddish brown and reddish brown, friable loam and loamy sand. The substratum to a depth of about 60 inches is reddish brown sandy loam.

The Cathro soils are nearly level and are in depressions. They are very poorly drained. Typically, the surface layer is black muck about 7 inches thick. Below this is black muck about 19 inches thick. The substratum to a depth of about 60 inches is dark gray and brown very fine sandy loam and fine sandy loam.

Of minor extent in this association are the somewhat excessively drained Karlin soils, the well drained Pence and Keweenaw soils, the somewhat poorly drained Solona soils, and the poorly drained Ensley and Waucedah soils. Karlin, Pence, and Keweenaw soils are coarser textured and more droughty than the major soils. They are in landscape positions similar to those of the Sagola and Trenary soils. Solona and Ensley soils are in drainageways and depressions on uplands. They commonly are adjacent to and slightly higher than the Cathro soils. Waucedah soils are adjacent to streams and are subject to frequent flooding.

This association is used mainly as woodland. The major management concerns are an equipment limitation in areas of all the major soils and windthrow in areas of the Cathro soils.

Some areas of the Sagola and Trenary soils are used as cropland. The major management concern is water erosion.

Nearly Level to Very Steep, Somewhat Excessively Drained to Poorly Drained, Loamy Soils

These soils are used mainly as woodland. An equipment limitation, seedling mortality, and windthrow are the major management concerns. Some of the soils are used as cropland. If cultivated crops are grown, water erosion and seasonal wetness are management concerns.

7. Trenary-Solona-Karlin Association

Nearly level to rolling, somewhat excessively drained, well drained, and somewhat poorly drained, loamy soils on ground moraines and end moraines

Areas of these soils are on ground moraines and end moraines. Slopes range from 0 to 18 percent.

This association makes up about 1 percent of the county. It is about 40 percent Trenary and similar soils, 15 percent Solona and similar soils, 10 percent Karlin and similar soils, and 35 percent soils of minor extent.

The Trenary soils are in nearly level to rolling areas and are well drained. Typically, the surface layer is black fine sandy loam about 4 inches thick. The subsurface layer is brown fine sandy loam about 1 inch thick. The subsoil is about 31 inches thick. The upper part is dark brown, friable fine sandy loam. The next part is dark reddish brown and reddish brown, firm sandy loam and loamy sand. The lower part is dark reddish brown and reddish brown, friable loam and loamy sand. The substratum to a depth of about 60 inches is reddish brown sandy loam.

The nearly level Solona soils are in drainageways. They are somewhat poorly drained. Typically, the surface layer is black very fine sandy loam about 6 inches thick. The subsurface layer is brown, mottled very fine sandy loam about 6 inches thick. The subsoil is about 24 inches thick. The upper part is brown, mottled, friable very fine sandy loam. The lower part is yellowish red and brown, friable loam and loamy sand. The substratum to a depth of about 60 inches is yellowish red sandy loam.

The Karlin soils are nearly level to rolling and are on broad plains, knolls, and back slopes. They are somewhat excessively drained. Typically, the surface layer is black fine sandy loam about 2 inches thick. The subsurface layer is reddish gray fine sandy loam about 1 inch thick. The subsoil is about 32 inches thick. The upper part is brown, friable fine sandy loam. The lower part is brown and yellowish red, friable and very friable sandy loam and loamy sand. The substratum to a depth of about 60 inches is brown sand.

Of minor extent in this association are the well drained Oconto soils, the well drained or moderately well drained Wabeno soils, the somewhat poorly

drained Au Gres soils, the poorly drained Ensley and Witbeck soils, and the very poorly drained Lupton soils. Oconto soils have a substratum of very gravelly coarse sand. Wabeno soils have very firm layers in the subsoil that limit rooting depth. Oconto and Wabeno soils are in landscape positions similar to those of the Trenary and Karlin soils. Au Gres soils are coarser textured and more droughty than the major soils. Au Gres, Ensley, and Witbeck soils are in landscape positions similar to those of the Solona soils. Lupton soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation in areas of all the major soils and seedling mortality in areas of the Solona soils.

Some areas are used as cropland. The major management concerns are water erosion on the Trenary and Karlin soils and seasonal wetness on the Solona soils.

8. Champion-Net Association

Nearly level to hilly, well drained to somewhat poorly drained, loamy soils on ground moraines and end moraines

Areas of these soils are in drainageways and on ground moraines and end moraines. Slopes range from 0 to 35 percent.

This association makes up about 7 percent of the county. It is about 50 percent Champion and similar soils, 15 percent Net and similar soils, and 35 percent soils of minor extent.

The Champion soils are in nearly level to hilly areas and are moderately well drained and well drained. Typically, the surface layer is black, partially decomposed organic material about 1 inch thick. The subsurface layer is gray very fine sandy loam about 3 inches thick. The subsoil is about 45 inches thick. The upper part is dark reddish brown and dark brown, very friable and friable very fine sandy loam. The next part is dark brown and brown, friable very fine sandy loam. The lower part is dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam. The substratum to a depth of about 60 inches is grayish brown gravelly fine sandy loam.

The Net soils are nearly level and are in drainageways. They are somewhat poorly drained. Typically, the surface layer is dark brown very fine sandy loam about 3 inches thick. The subsurface layer is brown very fine sandy loam about 3 inches thick. The subsoil is about 43 inches thick. The upper part is dark brown, mottled, friable very fine sandy loam and fine sandy loam. The lower part is brown and dark brown, mottled, very firm gravelly loamy sand and gravelly sandy loam. The substratum to a depth of about 60 inches is dark brown gravelly sandy loam.

Of minor extent in this association are the somewhat excessively drained or moderately well drained Karlin soils, the well drained or moderately well drained Sundog soils, the moderately well drained Croswell soils, the poorly drained Witbeck soils, and the very poorly drained Lupton and Greenwood soils. Karlin, Sundog, and Croswell soils are coarser textured and more droughty than the major soils. They are in landscape positions similar to those of the Champion soils. Witbeck soils are in landscape positions similar to those of the Net soils. Lupton and Greenwood soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation and windthrow in areas of the Champion and Net soils and seedling mortality in areas of the Net soils.

9. Sundog-Minocqua-Channing Association

Nearly level to very steep, well drained to poorly drained, loamy soils on stream terraces, outwash plains, eskers, and crevasse fillings

Areas of these soils are on stream terraces, outwash plains, and eskers and in depressions and drainageways. Slopes range from 0 to 50 percent.

This association makes up about 8.2 percent of the county. It is about 40 percent Sundog and similar soils, 15 percent Minocqua and similar soils, 10 percent Channing and similar soils, and 35 percent soils of minor extent (fig. 3).

The Sundog soils are in nearly level to steep areas and are well drained and moderately well drained. Typically, the surface layer is dark brown very fine sandy loam about 4 inches thick. The subsurface layer is gray very fine sandy loam about 2 inches thick. The subsoil is about 16 inches thick. The upper part is dark reddish brown and dark brown, friable very fine sandy loam. The lower part is brown, friable gravelly very fine sandy loam. The substratum to a depth of about 60 inches is brown sand and very gravelly coarse sand.

The Minocqua soils are nearly level and are in depressions. They are poorly drained. Slopes range from 0 to 2 percent. Typically, the surface layer is black muck about 4 inches thick. The subsurface layer is very dark gray silt loam about 2 inches thick. The subsoil is about 23 inches thick. The upper part is gray, mottled, friable loam. The lower part is grayish brown, loose loamy coarse sand. The substratum to a depth of about 60 inches is dark grayish brown, stratified coarse sand and gravelly coarse sand.

The Channing soils are nearly level and are in

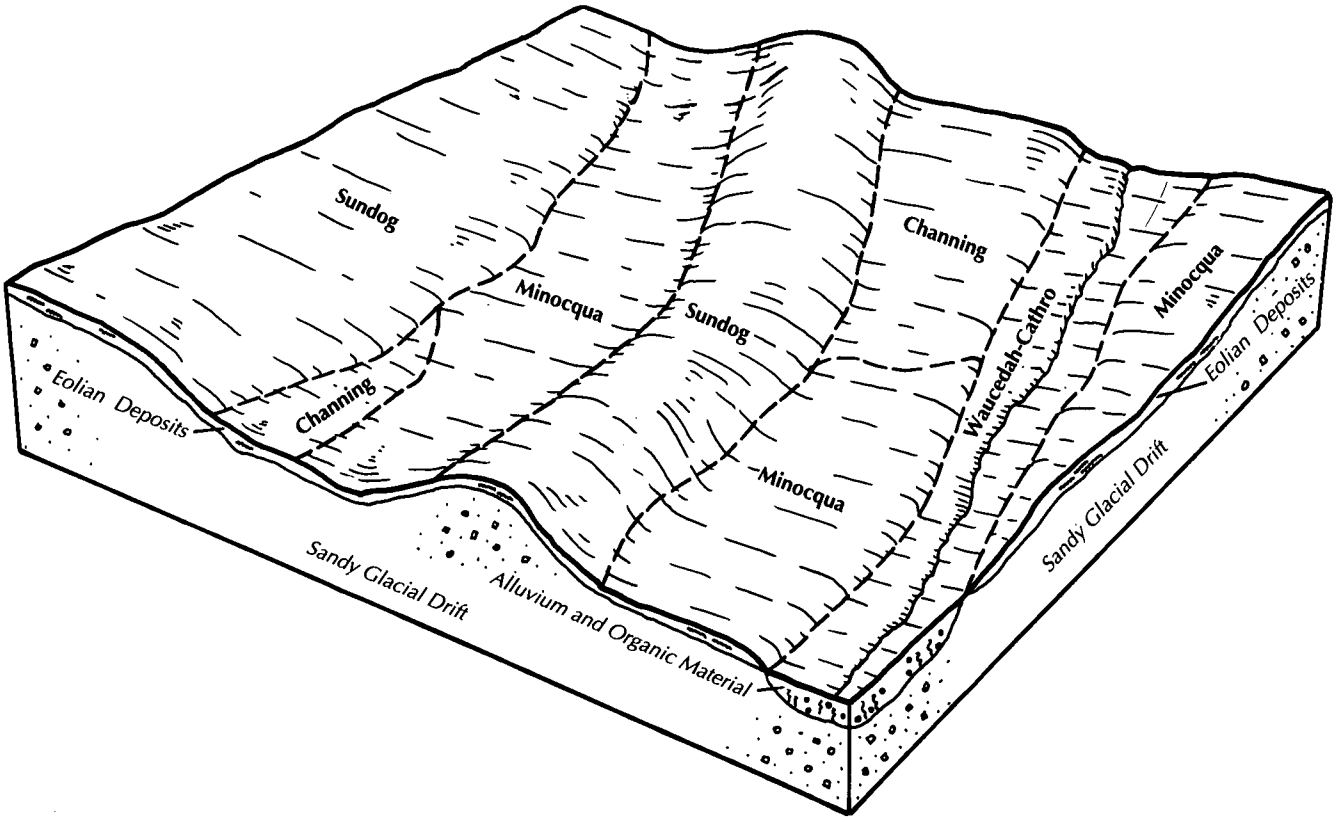


Figure 3.—Typical pattern of soils and parent material in the Sundog-Minocqua-Channing association.

drainageways. They are somewhat poorly drained. Typically, the surface layer is very dark grayish brown very fine sandy loam about 2 inches thick. The subsurface layer is grayish brown, mottled very fine sandy loam about 2 inches thick. The subsoil is dark yellowish brown, mottled, friable very fine sandy loam about 19 inches thick. The substratum extends to a depth of about 60 inches. It is strong brown and brown sand and loamy sand in the upper part and brown, stratified coarse sand and very gravelly sand in the lower part.

Of minor extent in this association are the excessively drained Vilas soils, the somewhat excessively drained or moderately well drained Karlin soils, the moderately well drained Croswell soils, the poorly drained Waucedah soils, and the very poorly drained Cathro and Merwin soils. Vilas, Karlin, and Croswell soils are coarser textured and more droughty than the Sundog soils. They are in landscape positions similar to those of the Sundog soils. Waucedah soils are adjacent to streams and are subject to frequent flooding. Cathro and Merwin soils have organic layers that are more than 16 inches thick. They are in landscape positions similar to those of the Minocqua soils.

This association is used mainly as woodland. The major management concerns are an equipment limitation in areas of all the major soils and windthrow and seedling mortality in areas of the Minocqua and Channing soils.

Some areas of the Sundog soils are used as cropland. The major management concern is water erosion.

Nearly Level to Very Steep, Well Drained and Moderately Well Drained, Loamy Soils on Ground Moraines, End Moraines, and Drumlins

These soils are used mainly as woodland. An equipment limitation and windthrow are the major management concerns. Some of the soils are used as cropland. If cultivated crops are grown, water erosion is a concern.

10. Wabeno Association

Nearly level to rolling, moderately well drained, loamy

soils on ground moraines, end moraines, and drumlins

Areas of these soils are on ground moraines and drumlins. Slopes range from 1 to 18 percent.

This association makes up about 23.5 percent of the county. It is about 65 percent Wabeno and similar soils and 35 percent soils of minor extent (fig. 4).

The Wabeno soils are moderately well drained. Typically, the surface layer is black silt loam about 2 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 46 inches thick. The upper part is dark brown and brown, friable silt loam. The next part is dark brown and brown, mottled, friable and very firm silt loam and very fine sandy loam. The lower part is reddish brown, very firm sandy loam. The substratum to a depth of about 60 inches is brown sandy loam.

Of minor extent in this association are the well drained Stambaugh and Padus soils; the well drained or moderately well drained Champion and Fence soils; the somewhat poorly drained Gaastra, Monico, and Net soils; the poorly drained Witbeck soils; the very poorly drained, nonacid Borosaprists; and the very poorly drained Lupton soils. Stambaugh and Padus soils have a substratum of gravelly sand. Champion soils are coarser textured than the Wabeno soils and are less productive. Fence soils do not have very firm layers in the subsoil and thus have a greater rooting depth than the Wabeno soils. Stambaugh, Padus, Champion, and Fence soils are in landscape positions similar to those of the Wabeno soils. Gaastra, Monico, Net, and Witbeck soils are in drainageways and on low flats in the uplands. Lupton soils and the nonacid Borosaprists are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation and windthrow.

Some areas are used as cropland. The major management concerns are stoniness and water erosion.

11. Peavy Association

Nearly level to rolling, well drained and moderately well drained, loamy soils on ground moraines and end moraines

Areas of these soils are on ground moraines and end moraines. Slopes range from 1 to 18 percent.

This association makes up about 1.7 percent of the county. It is about 65 percent Peavy and similar soils and 35 percent soils of minor extent (fig. 5).

Typically, the surface layer of the Peavy soils is dark reddish brown silt loam about 6 inches thick. The subsoil is dark reddish brown, very firm channery loam about 35 inches thick. The substratum to a depth of about 60 inches is dark reddish brown channery sandy loam.

Of minor extent in this association are the somewhat excessively drained Karlin soils, the well drained Padus and Sarona soils, the somewhat poorly drained Net soils, the poorly drained Witbeck soils, and the very poorly drained Lupton and Cathro soils. Karlin soils are coarser textured and more droughty than the major soils. Padus soils have a substratum of gravelly sand. Sarona soils have a friable subsoil. Karlin, Padus, and Sarona soils are in landscape positions similar to those of the Peavy soils. Net and Witbeck soils are in drainageways and on low flats in the uplands. Lupton and Cathro soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation and windthrow.

Some areas are used as cropland. The major management concern is water erosion.

12. Champion Association

Nearly level to hilly, well drained and moderately well drained, loamy soils on ground moraines and drumlins

Areas of these soils are on ground moraines and drumlins. Slopes range from 1 to 35 percent.

This association makes up about 8.4 percent of the county. It is about 65 percent Champion and similar soils and 35 percent soils of minor extent.

Typically, the surface layer of the Champion soils is black, partially decomposed organic material about 1 inch thick. The subsurface layer is gray very fine sandy loam about 3 inches thick. The subsoil is about 45 inches thick. The upper part is dark reddish brown and dark brown, very friable and friable very fine sandy loam. The next part is dark brown and brown, friable very fine sandy loam. The lower part is dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam. The substratum to a depth of about 60 inches is grayish brown gravelly fine sandy loam.

Of minor extent in this association are the well drained, coarse-loamy Typic Dystrochrepts that have a sandy substratum; the somewhat poorly drained, coarse-loamy Typic Fragiaquods; and the very poorly drained, nonacid and acid Borosaprists. Typic Dystrochrepts have a coarser textured substratum than the Champion soils and are less productive. They are in landscape positions similar to those of the Champion soils. Typic Fragiaquods are in drainageways and on low flats in the uplands. Borosaprists are in depressions on uplands and on lowlands.

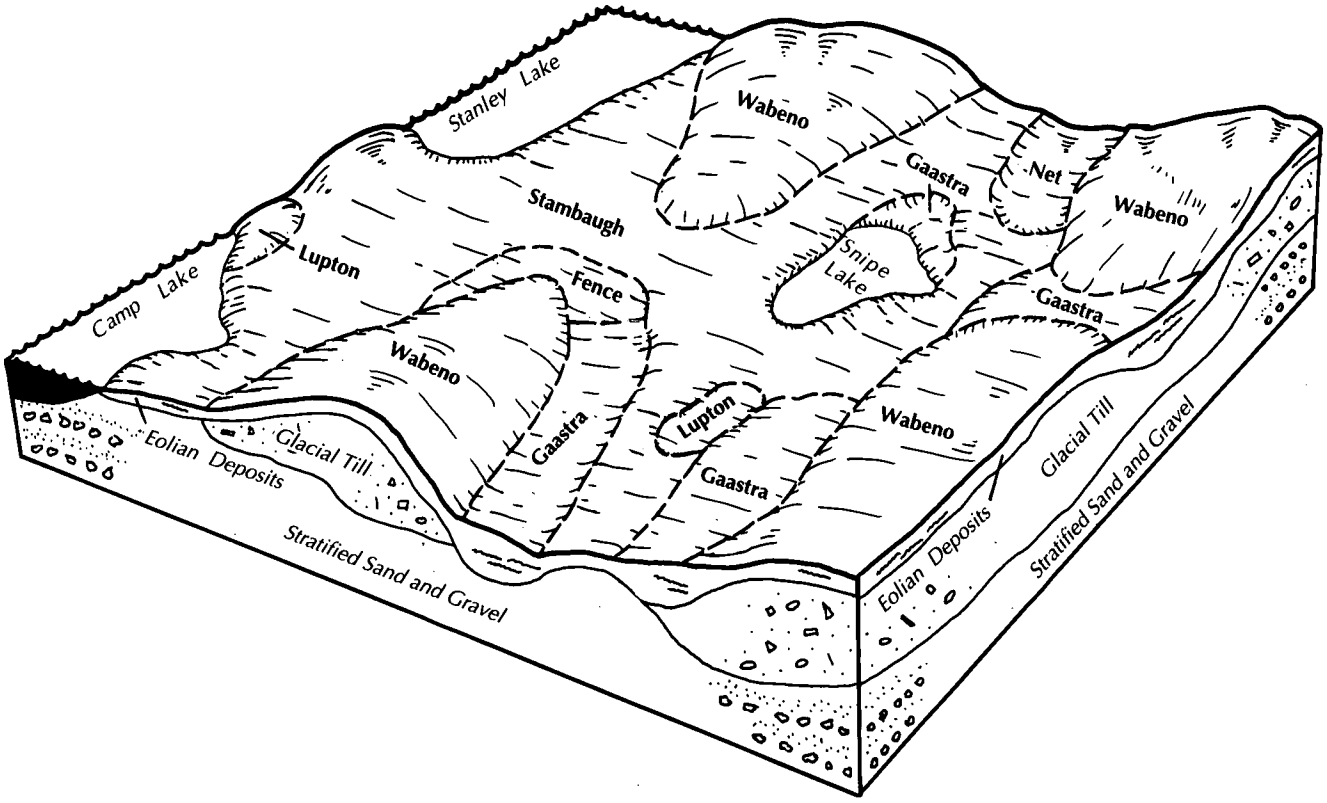


Figure 4.—Typical pattern of soils and parent material in the Wabeno association.

This association is used mainly as woodland. The major management concerns are an equipment limitation, seedling mortality, and windthrow.

Some areas are used as cropland. The major management concerns are water erosion and stoniness.

13. Sarona-Wabeno Association

Nearly level to hilly, well drained and moderately well drained, loamy soils on ground moraines and end moraines

Areas of these soils are on ground moraines and end moraines. Slopes range from 1 to 35 percent.

This association makes up about 0.6 percent of the county. It is about 35 percent Sarona and similar soils, 30 percent Wabeno and similar soils, and 35 percent soils of minor extent.

The Sarona soils are in nearly level to hilly areas and are well drained. Typically, the surface layer is very dark gray fine sandy loam about 2 inches thick. The subsurface layer is brown fine sandy loam about 5 inches thick. The subsoil is about 30 inches thick. The upper part is dark brown and brown, friable fine sandy loam and loamy fine sand. The lower part is dark brown, friable loam. The substratum to a depth of about 60 inches is reddish brown gravelly sandy loam.

The Wabeno soils are in nearly level to rolling areas and are moderately well drained. Typically, the surface layer is black fine sandy loam about 2 inches thick. The subsurface layer is brown fine sandy loam about 2 inches thick. The subsoil is about 46 inches thick. The upper part is dark brown, friable fine sandy loam. The next part is dark brown and brown, mottled, friable and very firm silt loam and very fine sandy loam. The lower part is reddish brown, very firm sandy loam. The substratum to a depth of about 60 inches is brown sandy loam.

Of minor extent in this association are the somewhat excessively drained Karlin soils; the well drained Keweenaw, Ocqueoc, and Pence soils; the somewhat poorly drained Net soils; the poorly drained Witbeck soils; and the very poorly drained Cathro and Lupton soils. Karlin, Keweenaw, Ocqueoc, and Pence soils are coarser textured and more droughty than the major soils. They are in landscape positions similar to those of the major soils. Net and Witbeck soils are in

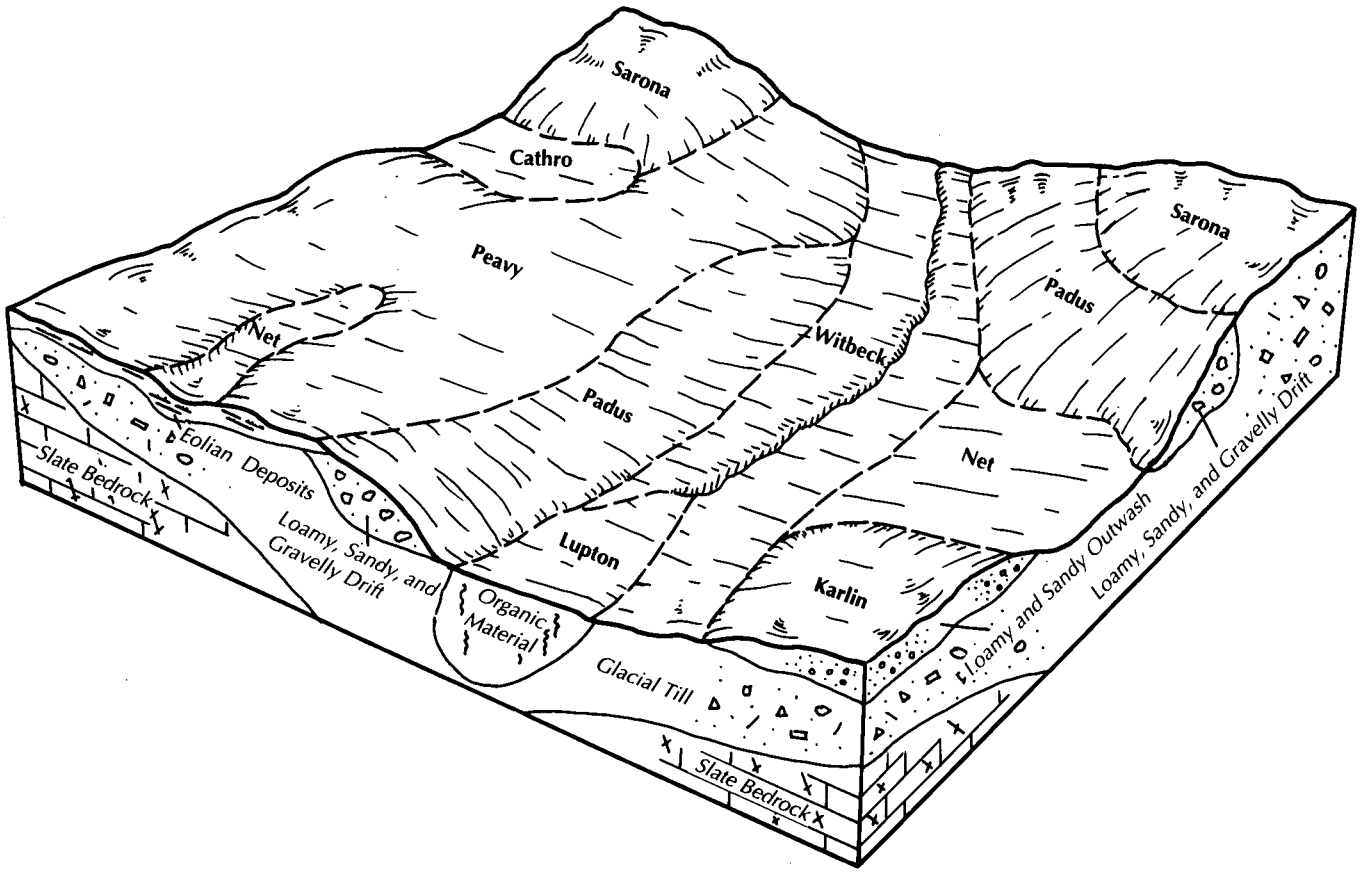


Figure 5.—Typical pattern of soils and parent material in the Peavy association.

drainageways and on low flats in the uplands. Cathro and Lupton soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concern is an equipment limitation in areas of the Sarona and Wabeno soils and windthrow in areas of the Wabeno soils.

Some areas are used as cropland. The major management concern is water erosion.

14. Petticoat-Wabeno Association

Nearly level to rolling, well drained and moderately well drained, loamy soils on ground moraines

Areas of these soils are on ground moraines. Slopes range from 1 to 18 percent.

This association makes up about 5.1 percent of the county. It is about 40 percent Petticoat and similar soils, 35 percent Wabeno and similar soils, and 25 percent soils of minor extent.

The Petticoat soils are well drained or moderately well drained. Typically, the surface layer is black silt loam about 1 inch thick. The subsurface layer is reddish gray silt loam about 3 inches thick. The subsoil is about 34 inches thick. The upper part is dark reddish brown and dark brown, friable silt loam. The lower part is brown and dark brown, mottled, friable and firm silt loam and loam. The substratum to a depth of about 60 inches is brown gravelly loamy sand.

The Wabeno soils are moderately well drained. Typically, the surface layer is black silt loam about 2 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 46 inches thick. The upper part is dark brown, friable silt loam. The next part is dark brown and brown, mottled, friable and very firm silt loam and very fine sandy loam. The lower part is reddish brown, very firm sandy loam. The substratum to a depth of about 60 inches is brown sandy loam.

Of minor extent in this association are the well drained and moderately well drained Sundog soils, the well drained Pence soils, the moderately well drained Manitowish soils, the somewhat poorly drained Net soils, the poorly drained Witbeck soils, and the very

poorly drained Lupton and Greenwood soils. Sundog, Pence, and Manitowish soils are coarser textured and more droughty than the major soils. They are in landscape positions similar to those of the major soils. Net and Witbeck soils are in drainageways and on low flats in the uplands. Lupton and Greenwood soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation in areas of the Petticoat and Wabeno soils and windthrow in areas of the Wabeno soils.

15. Goodman-Wabeno-Sundog Association

Nearly level to very steep, well drained and moderately well drained, loamy soils on ground moraines and end moraines

Areas of these soils are on ground moraines and end moraines. Slopes range from 1 to 50 percent.

This association makes up about 1.8 percent of the county. It is about 30 percent Goodman and similar soils, 25 percent Wabeno and similar soils, 15 percent Sundog and similar soils, and 30 percent soils of minor extent.

The Goodman soils are in nearly level to steep areas and are moderately well drained or well drained. Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 2 inches thick. The subsoil is about 44 inches thick. The upper part is dark brown and brown, friable very fine sandy loam, and the lower part is dark reddish brown, friable fine sandy loam and brown, friable loamy sand. The substratum to a depth of about 60 inches is reddish brown fine sandy loam.

The Wabeno soils are in nearly level to rolling areas and are moderately well drained. Typically, the surface layer is black silt loam about 2 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 46 inches thick. The upper part is dark brown, friable silt loam. The next part is dark brown and brown, mottled, friable and very firm silt loam and very fine sandy loam. The lower part is reddish brown, very firm sandy loam. The substratum to a depth of about 60 inches is brown sandy loam.

The Sundog soils are in nearly level to steep areas and are well drained and moderately well drained. Typically, the surface layer is dark brown very fine sandy loam about 4 inches thick. The subsurface layer is gray very fine sandy loam about 2 inches thick. The subsoil is about 16 inches thick. The upper part is dark reddish brown and dark brown, friable very fine sandy loam. The lower part is brown, friable gravelly very fine sandy loam. The substratum to a depth of about 60 inches is brown sand and coarse sand.

Of minor extent in this association are the somewhat excessively drained Karlin soils, the well drained Pence soils, the somewhat poorly drained Net soils, the poorly drained Witbeck soils, and the very poorly drained Lupton and Greenwood soils. Karlin and Pence soils are coarser textured and more droughty than the major soils. They are in landscape positions similar to those of the major soils. Net and Witbeck soils are in drainageways and on low flats in the uplands. Lupton and Greenwood soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concerns are an equipment limitation in areas of all the major soils and windthrow in areas of the Wabeno soils.

Nearly Level to Hilly, Somewhat Excessively Drained to Moderately Well Drained, Loamy Soils on Outwash Plains, Stream Terraces, Deltas, and Eskers

These soils are used mainly as woodland. An equipment limitation and windthrow are the major management concerns. Some of the soils are used as cropland. If cultivated crops are grown, water erosion is a concern.

16. Entic Haplorthods, Sandy, Stratified Substratum, Association

Nearly level to rolling, somewhat excessively drained, loamy soils on outwash plains and deltas

Areas of these soils are on outwash plains and deltas. Slopes range from 1 to 18 percent.

This association makes up about 1.4 percent of the county. It is about 65 percent Entic Haplorthods and similar soils and 35 percent soils of minor extent.

Typically, the surface layer of the Entic Haplorthods is black sandy loam about 1 inch thick. The subsurface layer is reddish gray loamy sand about 2 inches thick. The subsoil is about 39 inches thick. The upper part is reddish brown, friable loamy sand. The next part is yellowish red, loose gravelly coarse sand. The lower part is light brown, loose sand. The substratum to a depth of about 60 inches is light brown sand that has strata of fine sand, loamy fine sand, and gravelly coarse sand.

Of minor extent in this association are the somewhat excessively drained Karlin soils; the well drained Pence soils and Haplorthods; and the very poorly drained, nonacid and acid Borohemists. Karlin and Pence soils and Haplorthods are finer textured than the Entic Haplorthods and are more productive. They are in landscape positions similar to those of the Entic Haplorthods. Borohemists are in depressions

on uplands and on lowlands.

This association is used mainly as woodland. The major management concern is an equipment limitation.

17. Pence-Lode Association

Nearly level to rolling, well drained, loamy soils on outwash plains and stream terraces

Areas of these soils are on outwash plains and stream terraces. Slopes range from 1 to 18 percent.

This association makes up about 6.4 percent of the county. It is about 45 percent Pence and similar soils, 20 percent Lode and similar soils, and 35 percent soils of minor extent.

Typically, the surface layer of the Pence soils is black, partially decomposed organic material. The subsurface layer is light brownish gray fine sandy loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is dark brown, friable fine sandy loam and sandy loam. The lower part is strong brown, loose gravelly sand. The substratum to a depth of about 60 inches is dark yellowish brown, stratified gravelly coarse sand and sand.

Typically, the surface layer of the Lode soils is dark brown silt loam about 7 inches thick. The subsoil is about 30 inches thick. The upper part is dark brown and reddish brown, mottled, friable loam and sandy loam. The lower part is strong brown, loose coarse sand. The substratum to a depth of about 70 inches is brown and dark yellowish brown sand.

Of minor extent in this association are the somewhat poorly drained Monico soils that have an apparent water table; the poorly drained Humaquepts that have a sandy substratum; the very poorly drained, nonacid Borosaprists; and the very poorly drained, occasionally flooded Fluvaquents. Monico soils and Humaquepts are in drainageways and on low flats in the uplands. Borosaprists are in depressions on uplands and on lowlands. Fluvaquents are adjacent to streams.

This association is used mainly as woodland. The major management concern is an equipment limitation.

Some areas are used as cropland. The major management concerns are droughtiness in areas of the Pence soils and water erosion in areas of the Pence and Lode soils.

18. Padus-Pence Association

Nearly level to hilly, well drained, loamy soils on outwash plains, stream terraces, and eskers

Areas of these soils are on outwash plains, stream terraces, and eskers. Slopes range from 1 to 35 percent.

This association makes up about 5.6 percent of the county. It is about 35 percent Padus and similar soils, 30 percent Pence and similar soils, and 35 percent soils of minor extent.

Typically, the surface layer of the Padus soils is very dark grayish brown fine sandy loam about 7 inches thick. The subsoil is about 32 inches thick. The upper part is dark brown and brown, friable fine sandy loam. The next part is reddish brown and brown, friable gravelly fine sandy loam and fine sandy loam. The lower part is dark reddish brown, friable gravelly fine sandy loam. The substratum to a depth of about 60 inches is brown gravelly coarse sand.

Typically, the surface layer of the Pence soils is black, partially decomposed organic material about 1 inch thick. The subsurface layer is light brownish gray fine sandy loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is dark brown, friable fine sandy loam and sandy loam. The lower part is strong brown, loose gravelly sand. The substratum to a depth of about 60 inches is dark yellowish brown, stratified coarse sand and sand.

Of minor extent in this association are the excessively drained Vilas soils, the moderately well drained Croswell and Karlin soils, the somewhat poorly drained Channing soils, and the very poorly drained Lupton, Cathro, and Merwin soils. Vilas soils are coarser textured and more droughty than the major soils. Vilas, Croswell, and Karlin soils are in landscape positions similar to those of the major soils. Channing soils are in drainageways and on low flats in the uplands. Lupton, Cathro, and Merwin soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concern is an equipment limitation.

Some areas are used as cropland. The major management concern is water erosion.

19. Oconto Association

Nearly level to rolling, well drained, loamy soils on outwash plains

Areas of these soils are on outwash plains. Slopes range from 1 to 18 percent.

This association makes up about 0.6 percent of the county. It is about 90 percent Oconto and similar soils and 10 percent soils of minor extent.

Typically, the surface layer of the Oconto soils is dark brown very fine sandy loam about 7 inches thick. The subsurface layer is brown very fine sandy loam about 4 inches thick. The subsoil is about 24 inches thick. The upper part is strong brown and dark brown, friable and firm very fine sandy loam. The lower part is

dark brown, friable gravelly loam. The substratum to a depth of about 60 inches is strong brown very gravelly coarse sand.

Of minor extent in this association are the somewhat excessively drained Karlin soils, the somewhat poorly drained Channing soils, the poorly drained Minocqua and Waucedah soils, and the very poorly drained Cathro and Lupton soils. Karlin soils are coarser textured and more droughty than the Oconto soils. They are in landscape positions similar to those of the Oconto soils. Channing and Minocqua soils are in drainageways and on low flats in the uplands. Waucedah soils are adjacent to streams and are subject to frequent flooding. Cathro and Lupton soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concern is an equipment limitation.

Some areas are used as cropland. The major management concerns are water erosion and soil blowing.

20. Stambaugh-Padus Association

Nearly level to hilly, well drained and moderately well drained, loamy soils on outwash plains and stream terraces

Areas of these soils are on outwash plains and stream terraces. Slopes range from 1 to 35 percent.

This association makes up about 3.1 percent of the county. It is about 35 percent Stambaugh and similar soils, 25 percent Padus and similar soils, and 40 percent soils of minor extent.

The Stambaugh soils are in nearly level to rolling areas and are moderately well drained and well drained. Typically, the surface layer is very dark gray silt loam about 4 inches thick. The subsoil is about 35 inches thick. The upper part is dark brown, brown, and yellowish brown, friable silt loam and very fine sandy loam. The lower part is reddish brown and brown, mottled, firm silt loam. The substratum to a depth of about 60 inches is dark brown very gravelly sand and reddish brown gravelly sand.

The Padus soils are in nearly level to rolling areas and are well drained. Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The subsoil is about 32 inches thick. The upper part is dark brown and brown, friable fine sandy loam. The next part is reddish brown and brown, friable gravelly fine sandy loam and fine sandy loam. The lower part is dark reddish brown, friable gravelly fine sandy loam. The substratum to a depth of about 60 inches is brown gravelly coarse sand.

Of minor extent in this association are the excessively drained Vilas soils, the somewhat excessively drained or moderately well drained Karlin soils, the moderately well drained Croswell and Wabeno soils, the somewhat poorly drained Gaastra soils, and the very poorly drained Cathro and Merwin soils. Vilas, Karlin, and Croswell soils are coarser textured and more droughty than the major soils. Wabeno soils have very firm layers in the subsoil that limit rooting depth. Vilas, Karlin, Croswell, and Wabeno soils are in landscape positions similar to those of the major soils. Gaastra soils are in drainageways and on low flats in the uplands. Cathro and Merwin soils are in depressions on uplands and on lowlands.

This association is used mainly as woodland. The major management concern is an equipment limitation.

Some areas are used as cropland. The major management concern is water erosion.

Broad Land Use Considerations

The general soil map is helpful in identifying broad areas than can be developed for residential, industrial, agricultural, and other uses. It cannot be used, however, in the selection of sites for specific structures or specific crops.

About 90 percent of the acreage in Iron County is forested. Sugar maple is the dominant type of forest cover in areas of the Sarona, Sagola, Trenary, Wabeno, Net, Champion, Peavy, Petticoat, Goodman, and Stambaugh soils and the Haplorthods in associations 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, and 20. Aspen and paper birch are dominant in areas of the Karlin, Sundog, Channing, Lode, Pence, Padus, and Oconto soils in associations 4, 7, 9, 15, 17, 18, 19, and 20. Aspen, jack pine, and northern red oak are dominant in areas of the Vilas soils and the Entic Haplorthods in associations 3 and 16. Northern whitecedar, balsam fir, black spruce, and tamarack are the dominant cover types in areas of the Lupton, Cathro, and Minocqua soils in associations 1, 6, and 9.

Erosion and an equipment limitation are the major management concerns on the hilly and steep Sarona, Karlin, Sagola, Sundog, Pence, and Padus soils and the Haplorthods and Entic Haplorthods in associations 4, 5, 6, 7, 9, 13, 15, 16, 18, and 20. Erosion, the equipment limitation, and windthrow are the major management concerns on the hilly Champion soils in associations 8 and 12. Seedling mortality and the equipment limitation are the major management concerns on the Vilas soils in associations 3 and 4. Windthrow, seedling mortality, and the equipment limitation are the major management concerns on the Net, Solona, Minocqua, and Channing soils in associations 7, 8, and 9. Windthrow and the equipment limitation are the major management concerns on the nearly level to rolling Wabeno,

Champion, and Peavy soils in associations 8, 10, 11, 12, 13, 14, and 15. The equipment limitation is the major management concern on the rolling Karlin, Sagola, Trenary, Sundog, Petticoat, Goodman, Lode, Pence, Padus, Oconto, and Stambaugh soils and the Haplorthods and Entic Haplorthods in associations 4, 5, 6, 7, 9, 13, 14, 15, 16, 17, 18, 19, and 20. Windthrow and the equipment limitation are the major management concerns on the Lupton and Cathro soils in associations 1 and 6.

Cropland is concentrated in areas of associations 10, 11, 17, 19, and 20 in the southern and central parts of the county. The soils most commonly used for cultivated crops are the nearly level to rolling Wabeno, Peavy, Lode, Oconto, and Stambaugh soils. Some areas of Karlin, Sundog, Pence, and Padus soils in associations 4, 7, 9, 15, 18, and 20 also are used as cropland. The mucky soils in associations 1, 2, and 6 generally are not cultivated because of wetness and a short growing season. The Vilas soils in associations 3 and 4 generally are unsuited to cultivated crops because of droughtiness. Water erosion, soil blowing, droughtiness, low organic matter content, and tilth are the major management concerns affecting cropland in Iron County.

The nearly level and undulating Vilas, Karlin, Sagola, Trenary, Sundog, Lode, Pence, Padus, Oconto, and Stambaugh soils and Haplorthods and Entic Haplorthods in associations 3, 4, 5, 6, 7, 9, 13, 15, 16, 17, 18, 19, and 20 are suited to most intensive recreational uses, such as playgrounds, camp areas, picnic areas, and paths and trails. Small stones are a limitation in some areas. The Lupton, Cathro, Greenwood, Merwin, Net, Solona, Minocqua, and Channing soils in associations 1, 2, 6, 7, 8, and 9 generally are not suited to these uses because of wetness or ponding. The rolling soils in associations 4 through 20 generally are suited to camp areas, picnic areas, and paths and trails, but the slope and, in some cases, wetness and stones are limitations. The nearly level and undulating Wabeno, Champion, and Peavy soils in associations 8, 10, 11, and 12 generally are suited to picnic areas and paths and trails, but wetness and, in some cases, stones are limitations.

The loamy and sandy soils throughout the county generally are suited to both openland and woodland wildlife habitat. The Lupton, Cathro, Greenwood, Merwin, Net, Solona, Minocqua, and Channing soils in associations 1, 2, 6, 7, 8, and 9 generally are suited to wetland wildlife habitat.

The rolling Goodman soils in association 15 and the nearly level to rolling Sagola and Trenary soils in associations 4, 6, 7, and 13 generally are suited to building site development. The nearly level to rolling Vilas, Karlin, Sundog, Lode, Pence, Padus, Oconto, and Stambaugh soils and Entic Haplorthods and the rolling Petticoat soils in associations 3, 4, 7, 9, 14, 15, 16, 17, 18, 19, and 20 generally are suited to building site development but are severely limited as sites for septic tank absorption fields because of a poor filtering capacity. The nearly level to rolling Wabeno soils and the nearly level and undulating Peavy, Petticoat, and Goodman soils in associations 10, 11, 13, 14, and 15 generally are suited to dwellings without basements but are severely limited as sites for septic tank absorption fields because of wetness. The rolling Peavy soils in association 11 generally are suited to building site development but are severely limited as sites for septic tank absorption fields because of slow percolation. The nearly level to rolling Net, Champion, Solona, and Channing soils in associations 7, 8, and 9 are generally unsuited to building site development and septic tank absorption fields because of wetness. The Lupton, Cathro, Greenwood, Merwin, and Minocqua soils in associations 1, 2, 6, and 9 are unsuited to building site development and septic tank absorption fields because of ponding.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Padus fine sandy loam, 2 to 6 percent slopes, is a phase of the Padus series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Vilas-Karlin complex, 1 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Greenwood and Merwin peats is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

The map symbols designate the location of the map units in Iron County. Map units 50 to 168F are outside the Ottawa National Forest. Map units 500B to 556 are in the Ottawa National Forest.

Soil Descriptions

50—Aquents and Histosols, ponded

Setting

Landform and position on the landform: Depressions on ground moraines, outwash plains, and flood plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Texture: Aquents—sandy or loamy material; Histosols—16 to more than 51 inches of organic material over loamy or sandy material
Depth class: Very deep
Permeability: Aquents—variable; Histosols—moderately slow to moderately rapid in the organic material and variable in the mineral material
Available water capacity: Variable
Drainage class: Aquents—poorly drained; Histosols—very poorly drained
Seasonal high water table: Near the surface to 1 foot above the surface for most of the year
Surface runoff: Ponded
Flooding: None

Composition

Aquents and Histosols: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• Small areas of poorly drained soils at the edges of the unit

Use and Management

Land use: Wildlife habitat
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

51—Lupton-Cathro-Humaquepts complex

Setting

Landform and position on the landform: Depressions on ground moraines and outwash plains
Slope: 0 to 2 percent
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 2,500 acres

Typical Profile

Lupton

Surface layer:
0 to 10 inches—black muck

Subsoil:
10 to 60 inches—black muck

Cathro

Surface layer:
0 to 7 inches—black muck

Subsoil:
7 to 26 inches—black muck

Substratum:
26 to 60 inches—dark gray and brown very fine sandy loam and fine sandy loam

Humaquepts

Texture: 1 to 15 inches of well decomposed or partially decomposed organic material over loamy or sandy material

Soil Properties and Qualities

Depth class: Very deep
Permeability: Lupton—moderately slow to moderately rapid; Cathro—moderately slow to moderately rapid in the upper part and moderate or moderately slow in the lower part; Humaquepts—variable
Available water capacity: Lupton—high; Cathro—high; Humaquepts—variable
Drainage class: Lupton and Cathro—very poorly drained; Humaquepts—poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Lupton soil and similar soils: 35 to 45 percent
Cathro soil and similar soils: 30 to 40 percent
Humaquepts and similar soils: 20 to 25 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils in the higher landscape positions
• The excessively well drained or moderately well drained Karlin soils in the higher landscape positions
• The well drained Sarona soils in the higher landscape positions
• Greenwood and Merwin soils, which are more acid than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Areas that are subject to occasional flooding

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be

used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Lupton—2W; Cathro—5W
Michigan soil management group: Lupton—Mc; Cathro—M/3c
Primary habitat type: TTS
Secondary habitat type: None assigned

52—Greenwood and Merwin peats

Setting

Landform and position on the landform: Depressions on ground moraines and outwash plains
Slope: 0 to 2 percent
Shape of areas: Irregular or oval
Size of areas: 5 to 1,000 acres

Typical Profile

Greenwood

Surface layer:
0 to 5 inches—reddish brown peat

Subsoil:
5 to 18 inches—dark reddish brown and dark brown peat
18 to 60 inches—dark reddish brown mucky peat and muck

Merwin

Surface layer:
0 to 8 inches—yellowish brown peat

Subsoil:
8 to 36 inches—dark reddish brown mucky peat

Substratum:
36 to 60 inches—black silt loam and very dark grayish brown and brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Greenwood—moderate or moderately rapid; Merwin—rapid in the upper part, moderately slow in the lower part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Greenwood soil and similar soils: 0 to 90 percent
Merwin soil and similar soils: 10 to 95 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell, Manitowish, and Karlin soils in the higher landscape positions
• The well drained Pence and Sarona soils in the higher landscape positions
• Lupton and Cathro soils, which are less acid than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a substratum of sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc-a
Primary habitat type: PCS
Secondary habitat type: None assigned

53—Waucedah-Cathro mucks, frequently flooded

Setting

Landform and position on the landform: First bottom on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 1,000 acres

Typical Profile

Waucedah

Surface layer:
0 to 10 inches—black muck

Substratum:
10 to 60 inches—grayish brown and dark grayish brown, mottled fine sandy loam

Cathro

Surface layer:
0 to 7 inches—black muck

Subsoil:
7 to 26 inches—black muck

Substratum:
26 to 60 inches—dark gray and brown very fine sandy loam and fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Waucedah—moderate; Cathro—moderately slow to moderately rapid in the upper part and moderate or moderately slow in the lower part
Available water capacity: High
Drainage class: Waucedah—poorly drained; Cathro—very poorly drained
Seasonal high water table: Waucedah—2 feet above to 1 foot below the surface at some time from January through December; Cathro—1 foot above to 1 foot below the surface at some time from November through June
Surface runoff: Ponded
Flooding: Frequent

Composition

Waucedah soil and similar soils: 30 to 60 percent
Cathro soil and similar soils: 30 to 60 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils in the higher landscape positions
• The excessively well drained or moderately well drained Karlin soils in the higher landscape positions
• The well drained Sarona soils in the higher landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Waucedah—3W; Cathro—5W
Michigan soil management group: Waucedah—L-4c; Cathro—M/3c
Primary habitat type: FMC
Secondary habitat type: None assigned

54—Pits, sand and gravel

Setting

Landform: Ground moraines, outwash plains
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Composition

Pits: 100 percent

Use and Management

Land use: Source of sand and gravel

Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

55A—Oconto very fine sandy loam, 1 to 2 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 800 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown very fine sandy loam

Subsurface layer:
7 to 11 inches—brown very fine sandy loam
Subsoil:
11 to 28 inches—strong brown and dark brown, friable and firm very fine sandy loam
28 to 35 inches—dark brown, friable gravelly loam
Substratum:
35 to 60 inches—strong brown very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Oconto soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Karlin soils, which are more droughty than the Oconto soil; in landscape positions similar to those of the Oconto soil
• Trenary soils, which have a substratum of sandy loam; in landscape positions similar to those of the Oconto soil
• The somewhat poorly drained Channing soils in depressions and drainageways
Similar inclusions:
• Soils that have less than 35 percent gravel in the substratum
• Soils that have slopes of 2 to 6 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation
Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, low organic matter content, soil moisture content, tilth
Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, a cropping sequence that includes green manure crops, and crop residue management increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase the rate of deep percolation, the runoff rate, or the hazard of erosion (fig. 6).
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIs
Woodland ordination symbol: 3L
Michigan soil management group: 4a
Primary habitat type: TM
Secondary habitat type: ATD

55B—Oconto very fine sandy loam, 2 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown very fine sandy loam
Subsurface layer:
7 to 11 inches—brown very fine sandy loam
Subsoil:
11 to 28 inches—strong brown and dark brown, friable and firm very fine sandy loam
28 to 35 inches—dark brown, friable gravelly loam
Substratum:
35 to 60 inches—strong brown very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained



Figure 6.—Irrigated potatoes in an area of Oconto very fine sandy loam, 1 to 2 percent slopes.

Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Oconto soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- Karlin soils, which are more droughty than the Oconto soil; in landscape positions similar to those of the Oconto soil
- Trenary soils that have a substratum of sandy loam; in landscape positions similar to those of the Oconto soil
- The somewhat poorly drained Channing soils in the lower landscape positions

Similar inclusions:
- Soils in which the substratum has less than 35 percent gravel

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
- The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, soil moisture content, tilth

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Irrigation water should be applied at a rate that ensures optimum production but does not increase the

rate of deep percolation, the runoff rate, or the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L
Michigan soil management group: 4a
Primary habitat type: TM
Secondary habitat type: ATD

55D—Oconto very fine sandy loam, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown very fine sandy loam
Subsurface layer:
7 to 11 inches—brown very fine sandy loam
Subsoil:
11 to 28 inches—strong brown and dark brown, friable and firm very fine sandy loam
28 to 35 inches—dark brown, friable gravelly loam
Substratum:
35 to 60 inches—strong brown very gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Oconto soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin soils, which are more droughty than the Oconto soil; in landscape positions similar to those of the Oconto soil
• Trenary soils that have a substratum of sandy loam; in landscape positions similar to those of the Oconto soil
• The somewhat poorly drained Channing soils on foot slopes and in drainageways

Similar inclusions:
• Soils in which the substratum has less than 35 percent gravel

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3L
Michigan soil management group: 4a
Primary habitat type: TM
Secondary habitat type: ATD

56—Pits and dumps, mine

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Composition

Pits: 60 percent
Dumps: 40 percent

Use and Management

Land use: Wildlife habitat

Management measures:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

57A—Padus fine sandy loam, 1 to 2 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray fine sandy loam

Subsoil:
7 to 25 inches—dark brown and brown, friable fine sandy loam
25 to 35 inches—reddish brown and brown, friable gravelly fine sandy loam and fine sandy loam
35 to 39 inches—dark reddish brown, friable gravelly fine sandy loam

Substratum:
39 to 60 inches—brown gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Padus soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the Padus soil; in landscape positions similar to those of the Padus soil
• The somewhat poorly drained Channing soils in the lower landscape positions
• Stambaugh soils that have a surface layer and subsoil of silt loam, which are less droughty than the Padus soil; in landscape positions similar to those of the Padus soil

Similar inclusions:
• Soils that have slopes of 2 to 6 percent
• Soils that have thin layers of sandy loam in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIs
Woodland ordination symbol: 3L
Michigan soil management group: 3a-a
Primary habitat type: TM
Secondary habitat type: ATD

57B—Padus fine sandy loam, 2 to 6 percent slopes

Setting

Landform and position on the landform: Undulating areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray fine sandy loam

Subsoil:
7 to 25 inches—dark brown and brown, friable fine sandy loam
25 to 35 inches—reddish brown and strong brown, friable gravelly fine sandy loam and fine sandy loam
35 to 39 inches—dark reddish brown, friable gravelly fine sandy loam

Substratum:
39 to 60 inches—brown gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Padus soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the Padus soil; in landscape positions similar to those of the Padus soil
• The somewhat poorly drained Channing soils in the lower landscape positions
• Stambaugh soils that have a surface layer and subsoil of silt loam, which are less droughty than the Padus soil; in landscape positions similar to those of the Padus soil

Similar inclusions:
• Soils that have thin layers of sandy loam in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a-a
Primary habitat type: TM
Secondary habitat type: ATD

57D—Padus fine sandy loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray fine sandy loam

Subsoil:
7 to 25 inches—dark brown and brown, friable fine sandy loam
25 to 35 inches—reddish brown and strong brown,

friable gravelly fine sandy loam and fine sandy loam
35 to 39 inches—dark reddish brown, friable gravelly fine sandy loam

Substratum:
39 to 60 inches—brown gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1 percent
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Padus soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the Padus soil; in landscape positions similar to those of the Padus soil
• The somewhat poorly drained Channing soils on foot slopes and in depressions
• Stambaugh soils that have a surface layer and subsoil of silt loam, which are less droughty than the Padus soil; in landscape positions similar to those of the Padus soil

Similar inclusions:
• Soils that have thin layers of sandy loam in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a-a
Primary habitat type: TM
Secondary habitat type: ATD

57F—Padus fine sandy loam, 18 to 35 percent slopes, stony

Setting

Landform and position on the landform: Hilly areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray fine sandy loam

Subsoil:
7 to 25 inches—dark brown and brown, friable fine sandy loam
25 to 35 inches—reddish brown and strong brown, friable gravelly fine sandy loam and fine sandy loam
35 to 39 inches—dark reddish brown, friable gravelly fine sandy loam

Substratum:
39 to 60 inches—brown gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and

cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Padus soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the Padus soil; in landscape positions similar to those of the Padus soil
• The somewhat poorly drained Channing soils on foot slopes and in drainageways
• Stambaugh soils that have a surface layer and subsoil of silt loam, which are less droughty than the Padus soil; in landscape positions similar to those of the Padus soil

Similar inclusions:
• Soils that have thin layers of sandy loam in the substratum

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3a-a
Primary habitat type: TM
Secondary habitat type: ATD

58B—Trenary fine sandy loam, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black fine sandy loam

Subsurface layer:
4 to 5 inches—brown fine sandy loam

Subsoil:
5 to 12 inches—dark brown, friable fine sandy loam
12 to 23 inches—dark reddish brown and reddish brown, firm sandy loam and loamy sand
23 to 36 inches—dark reddish brown and reddish brown, friable loam and loamy sand

Substratum:
36 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Trenary soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Solona soils in the lower landscape positions
• Escanaba and Karlin soils, which are more droughty than the Trenary soil; in landscape positions similar to those of the Trenary soil

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.

• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.

• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: AVO
Secondary habitat type: None assigned

58D—Trenary fine sandy loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on knolls and back slopes on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black fine sandy loam

Subsurface layer:
4 to 5 inches—brown fine sandy loam

Subsoil:
5 to 12 inches—dark brown, friable fine sandy loam
12 to 23 inches—dark reddish brown and reddish brown, firm sandy loam and loamy sand
23 to 36 inches—dark reddish brown and reddish brown, friable loam and loamy sand

Substratum:
36 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Trenary soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Solona soils on foot slopes and in low fault areas

• Escanaba and Karlin soils, which are more droughty than the Trenary soil; in landscape positions similar to those of the Trenary soil

Similar inclusions:

• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.

• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: AVO
Secondary habitat type: None assigned

59A—Solona very fine sandy loam, 0 to 3 percent slopes, stony

Setting

Landform and position on the landform: Drainageways on ground moraines
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 6 inches—black very fine sandy loam

Subsurface layer:
6 to 12 inches—brown, mottled very fine sandy loam

Subsoil:
12 to 30 inches—brown, mottled, friable very fine sandy loam
30 to 36 inches—yellowish red and brown, friable loam and loamy sand

Substratum:
36 to 60 inches—yellowish red sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 3 feet below the surface at some time from March through July
Surface runoff: Slow
Flooding: None

Composition

Solona soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The well drained Trenary soils in the higher landscape positions

• The poorly drained Witbeck soils in depressions

• The sandy Au Gres soils in landscape positions similar to those of the Solona soil

Similar inclusions:

• Soils that have gravelly sand at a depth of 40 to 60 inches

• Soils that are moderately well drained

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:

• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.

• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.

• Areas of the better drained included Trenary soils are more suitable for landing sites.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, seasonal wetness, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop

rotations that include small grain and hay help to control soil blowing.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3W
Michigan soil management group: 3b
Primary habitat type: AVO-CI
Secondary habitat type: TMC

60D—Trenary-Rock outcrop complex, 1 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Nearly level to hilly areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Trenary

Surface layer:
0 to 4 inches—black fine sandy loam

Subsurface layer:
4 to 5 inches—brown fine sandy loam

Subsoil:
5 to 12 inches—dark brown, friable fine sandy loam
12 to 23 inches—dark reddish brown and reddish brown, firm sandy loam and loamy sand
23 to 36 inches—dark reddish brown and reddish brown, friable loam and loamy sand

Substratum:
36 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Trenary

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Trenary soil and similar soils: 75 to 80 percent
Rock outcrop: 10 to 20 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Solona soils on foot slopes and in depressions
• Escanaba and Karlin soils, which are more droughty than the Trenary soil; in landscape positions similar to those of the Trenary soil

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches
• Soils that are less than 60 inches deep over bedrock
• Areas where 0.01 to 0.1 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• The areas of Rock outcrop should be considered when road locations and landing sites are planned.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: TM
Secondary habitat type: ATD

64A—Channing very fine sandy loam, 0 to 3 percent slopes

Setting

Landform and position on the landform: Drainageways on outwash plains and stream terraces
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 80 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown very fine sandy loam
Subsurface layer:
7 to 9 inches—grayish brown very fine sandy loam
Subsoil:
9 to 24 inches—dark yellowish brown, mottled, friable very fine sandy loam
Substratum:
24 to 43 inches—strong brown and brown sand and loamy sand
43 to 60 inches—brown, stratified coarse sand and very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: 0.5 foot to 1.5 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Channing soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Manitowish and Sundog soils and the well drained Pence and Padus soils in the higher positions on the landscape
• The poorly drained Minocqua soils in depressions
• Au Gres soils that are sand throughout; in landscape positions similar to those of the Channing soil
Similar inclusions:
• Soils that have layers of silt loam in the substratum
• Areas where the surface is stony

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard
Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Small areas of the better drained included soils are more suitable for landing areas.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, low organic matter content, seasonal wetness, droughtiness, tilth
Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 2W
Michigan soil management group: 3/5b
Primary habitat type: TMC-Vac
Secondary habitat type: TMC

65—Witbeck muck, very stony

Setting

Landform and position on the landform: Depressions on ground moraines and end moraines
Slope: 0 to 2 percent

Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Subsurface layer:
5 to 8 inches—black silt loam

Subsoil:
8 to 18 inches—dark brown, mottled, friable silt loam

Substratum:
18 to 60 inches—grayish brown and brown, mottled fine sandy loam and gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate or moderately slow
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface at some time from November through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Witbeck soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils in the slightly higher positions on the landscape
• The very poorly drained, organic Cathro soils in landscape positions similar to those of the Witbeck soil
• Areas where stones cover more than 3 percent of the surface

Similar inclusions:
• Soils that have a surface layer of fine sandy loam

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Large stones on the surface can hinder harvesting operations and damage equipment.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 5W
Michigan soil management group: 3c
Primary habitat type: Fl
Secondary habitat type: None assigned

67B—Net very fine sandy loam, 0 to 4 percent slopes, very stony

Setting

Landform and position on the landform: Drainageways on ground moraines and end moraines
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—dark brown very fine sandy loam

Subsurface layer:
3 to 6 inches—brown, mottled very fine sandy loam

Subsoil:
6 to 28 inches—dark brown, mottled, friable very fine sandy loam and fine sandy loam
28 to 49 inches—a fragipan of dark brown and brown, mottled, very firm gravelly sandy loam and gravelly loamy sand

Substratum:
49 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Net soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Wabeno, Champion, and Petticoat soils in the higher positions on the landscape
- The poorly drained Witbeck soils in depressions

Similar inclusions:
- Areas where stones cover less than 1 percent of the surface

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Large stones on the surface can hinder harvesting operations and damage equipment.
- Special site preparation, such as bedding, can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3W
Michigan soil management group: 3b-af
Primary habitat type: TMC
Secondary habitat type: None assigned

68B—Net-Witbeck complex, 0 to 4 percent slopes, very stony

Setting

Landform and position on the landform: Net—drainageways on ground moraines and end moraines; Witbeck—depressions on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Net

Surface layer:
0 to 3 inches—dark brown silt loam

Subsurface layer:
3 to 6 inches—brown, mottled silt loam

Subsoil:
6 to 28 inches—dark brown, mottled, friable very fine sandy loam and fine sandy loam
28 to 49 inches—a fragipan of dark brown and brown, mottled, very firm gravelly sandy loam and gravelly loamy sand

Substratum:
49 to 60 inches—dark brown gravelly sandy loam

Witbeck

Surface layer:
0 to 5 inches—black muck

Subsurface layer:
5 to 8 inches—black silt loam

Subsoil:
8 to 18 inches—dark brown, mottled, friable silt loam

Substratum:
18 to 60 inches—grayish brown and brown, mottled fine sandy loam and gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Net—moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part; Witbeck—moderate or moderately slow
Available water capacity: Net—low; Witbeck—moderate
Drainage class: Net—somewhat poorly drained; Witbeck—poorly drained
Seasonal high water table: Net—perched at a depth of 0.5 foot to 1.5 feet at some time from November through May; Witbeck—0.5 foot above to 1.0 foot below the surface at some time from November through June
Surface runoff: Net—slow; Witbeck—very slow or ponded
Flooding: None

Composition

Net soil and similar soils: 50 to 70 percent
Witbeck soil and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Wabeno, Champion, and

Petticoat soils in the higher positions on the landscape
• The very poorly drained, organic Cathro soils in landscape positions similar to those of the Witbeck soil
• Soils in areas where stones cover more than 3 percent of the surface; in landscape positions similar to those of the Witbeck soil

Similar inclusions:
• Soils that do not have muck in the surface layer
• Soils in areas where stones cover less than 3 percent of the surface; in landscape positions similar to those of the Net soil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Large stones on the surface can hinder harvesting operations and damage equipment.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Witbeck soil.
• Special site preparation, such as bedding, can reduce the seedling mortality rate in areas of the Net soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Net—3W; Witbeck—5W
Michigan soil management group: Net—3b-af; Witbeck—3c
Primary habitat type: TMC
Secondary habitat type: FI

69A—Karlin, moderately wet-Croswell complex, 0 to 3 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown, mottled sand

Croswell

Surface layer:
0 to 1 inch—black sand

Subsurface layer:
1 to 5 inches—reddish gray sand

Subsoil:
5 to 20 inches—dark reddish brown and yellowish red, loose sand

Substratum:
20 to 60 inches—brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Karlin—moderately rapid in the upper part and rapid in the lower part; Croswell—rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 2 to 5 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Karlin soil and similar soils: 40 to 60 percent
Croswell soil and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and Channing soils in the slightly lower positions on the landscape
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that are well drained, somewhat excessively drained, or excessively drained
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Karlin—windthrow hazard; Croswell—equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment in areas of the Croswell soil, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions in areas of the Croswell soil can lower the seedling mortality rate. Replanting is needed in some areas.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Karlin—5A; Croswell—5S
Michigan soil management group: Karlin—4a; Croswell—5a
Primary habitat type: TMV
Secondary habitat type: TMC

70B—Sundog-Channing very fine sandy loams, 0 to 6 percent slopes, rocky, stony

Setting

Landform and position on the landform: Sundog—undulating areas on outwash plains and stream terraces; Channing—drainageways on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sundog

Surface layer:
0 to 4 inches—dark brown very fine sandy loam

Subsurface layer:
4 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 15 inches—dark reddish brown and dark brown, friable very fine sandy loam
15 to 22 inches—brown, friable gravelly very fine sandy loam

Substratum:
22 to 43 inches—brown sand with bands of loamy sand
43 to 60 inches—brown very gravelly sand with pockets of very fine sandy loam

Channing

Surface layer:
0 to 7 inches—dark brown very fine sandy loam

Subsurface layer:
7 to 9 inches—grayish brown very fine sandy loam

Subsoil:
9 to 24 inches—dark yellowish brown, mottled, friable very fine sandy loam

Substratum:
24 to 43 inches—strong brown and brown sand and loamy sand
43 to 60 inches—brown, stratified coarse sand and very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Sundog—moderate in the upper part and very rapid in the lower part; Channing—moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Sundog—well drained; Channing—somewhat poorly drained
Seasonal high water table: Sundog—at a depth of more than 6 feet; Channing—0.5 foot to 1.5 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Sundog soil and similar soils: 50 to 65 percent
Channing soil and similar soils: 20 to 35 percent
Rock outcrop: 1 to 10 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the major soils; in landscape positions similar to those of the Sundog soil
• The poorly drained Minocqua soils in depressions
• The somewhat poorly drained Au Gres soils, which are sand throughout; in landscape positions similar to those of the Channing soil

Similar inclusions:
• Soils that do not have a stony surface

Use and Management

Land use: Woodland

Major management concerns: Sundog—equipment limitation; Channing—equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in areas of the Sundog soil in spring and during other excessively

wet periods. Access is easiest during periods in winter when access roads are frozen.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table in areas of the Channing soil restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Areas of the better drained Sundog soil are more suitable sites for landings.
• Rock outcrops should be considered when planning road locations and landing sites.
• Special site preparation, such as bedding, can reduce the seedling mortality rate in areas of the Channing soil.
• Windthrow can be minimized in areas of the Channing soil by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Sundog—2L; Channing—2W
Michigan soil management group: Sundog—3/5a; Channing—3/5b
Primary habitat type: TMV
Secondary habitat type: TMC-Vac

71D—Karlin-Vilas-Rock outcrop complex, 1 to 18 percent slopes, stony

Setting

Landform and position on the landform: Nearly level to rolling areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Vilas

Surface layer:
0 to 4 inches—dark reddish brown loamy sand

Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand

Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand

Substratum:
24 to 60 inches—brown and light brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Karlin—moderately rapid in the upper part and rapid in the lower part; Vilas—rapid
Available water capacity: Low
Drainage class: Karlin—somewhat excessively drained; Vilas—excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Karlin—medium; Vilas—slow
Flooding: None

Composition

Karlin soil and similar soils: 35 to 50 percent
Vilas soil and similar soils: 25 to 40 percent
Rock outcrop: 10 to 25 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and moderately well drained Croswell and Karlin, moderately wet, soils in low, flat areas and on foot slopes
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a surface layer and subsoil of sand
• Soils that have a substratum of gravelly sand
• Areas that are not stony

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Although the equipment limitation is slight for most woodland operations, the nearly level and undulating

areas of the unit should be selected as sites for landings.
• The areas of Rock outcrop should be considered when road locations and landing sites are planned.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Karlin—3A; Vilas—6A
Michigan soil management group: Karlin—4a; Vilas—5.3a
Primary habitat type: TM
Secondary habitat type: TMV

72B—Karlin fine sandy loam, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains, stream terraces, ground moraines, and end moraines
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand
Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Karlin soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and Channing soils in the lower landscape positions
• The well drained Sarona soils, which are less droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil
• The excessively drained Vilas soils, which are more droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A
Michigan soil management group: 4a
Primary habitat type: TMV
Secondary habitat type: AQV

72D—Karlin fine sandy loam, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on

outwash plains, stream terraces, ground moraines, and end moraines
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand
Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Karlin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and Channing soils on foot slopes and in drainageways
• The well drained Sarona soils, which are less droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil
• The excessively drained Vilas soils, which are more droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil

Similar inclusions:
• Soils that have a substratum of gravelly sand
• Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: None

Management measures:
• Although the equipment limitation is slight for most woodland operations, the nearly level and undulating areas of the unit should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 4a
Primary habitat type: TMV
Secondary habitat type: AQV

72F—Karlin fine sandy loam, 18 to 35 percent slopes

Setting

Landform and position on the landform: Hilly areas on outwash plains, stream terraces, and end moraines
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Karlin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Sarona soils, which are less droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil
• The excessively drained Vilas soils, which are more droughty than the Karlin soil; in landscape positions similar to those of the Karlin soil
• Areas that have slopes of 35 to 50 percent

Similar inclusions:
• Soils that have a substratum of gravelly sand
• Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 4a
Primary habitat type: TMV
Secondary habitat type: AQV

73A—Gaastra silt loam, 0 to 3 percent slopes, stony

Setting

Landform and position on the landform: Nearly level areas on lake plains and ground moraines
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 50 acres

Typical Profile

Organic mat:
0 to 1 inch—black, well decomposed organic material

Surface layer:
1 to 4 inches—dark brown silt loam

Subsurface layer:
4 to 6 inches—brown, mottled silt loam

Subsoil:
6 to 51 inches—brown and dark yellowish brown, mottled, friable silt loam

Substratum:
51 to 60 inches—reddish brown silt loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderately slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Gaastra soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Witbeck soils in depressions
• Channing soils, which are coarser textured and more droughty than the Gaastra soil; in landscape positions similar to those of the Gaastra soil
• Net soils, which have a shallower rooting depth than the Gaastra soil; in landscape positions similar to those of the Gaastra soil

Similar inclusions:
• Soils that are moderately well drained

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, seasonal wetness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Fine sand and silt can plug tile lines. Tile drainage systems should be designed so that the rate of flowing water helps to keep the tile lines clean. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3W
Michigan soil management group: 2.5b
Primary habitat type: AVO-CI
Secondary habitat type: TMC

74A—Au Gres sand, 0 to 3 percent slopes

Setting

Landform and position on the landform: Drainageways on outwash plains and stream terraces
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsurface layer:
3 to 7 inches—brown sand

Subsoil:
7 to 32 inches—strong brown and brown, mottled, very friable sand

Substratum:
32 to 60 inches—dark yellowish brown sand with thin strata of coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: 0.5 foot to 1.5 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Au Gres soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Kinross soils in depressions

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Special site preparation, such as bedding, can

reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W
Michigan soil management group: 5b
Primary habitat type: TMC-Vac
Secondary habitat type: TMC

75—Kinross muck

Setting

Landform and position on the landform: Depressions on outwash plains and stream terraces
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Subsurface layer:
5 to 20 inches—brown, mottled fine sand and loamy fine sand

Subsoil:
20 to 27 inches—dark brown, loose fine sand
27 to 40 inches—brown, loose fine sand
40 to 52 inches—brown, mottled, loose fine sand

Substratum:
52 to 60 inches—yellowish red fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Slow or very slow
Flooding: None

Composition

Kinross soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils in the slightly higher positions on the landscape

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Site preparation, such as bedding, trenching, or mounding, can maximize growth and the seedling survival rate in new plantations.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: 5c-a
Primary habitat type: FMC
Secondary habitat type: None assigned

76—Ensley fine sandy loam, stony

Setting

Landform and position on the landform: Depressions on ground moraines and end moraines
Slope: 0 to 2 percent
Shape of areas: Irregular or long and narrow
Size of areas: 3 to 10 acres

Typical Profile

Surface layer:
0 to 3 inches—black fine sandy loam

Subsurface layer:
3 to 9 inches—dark grayish brown, mottled fine sandy loam

Subsoil:
9 to 20 inches—dark yellowish brown, mottled, friable fine sandy loam

Substratum:
20 to 30 inches—yellowish brown, mottled fine sandy loam
30 to 60 inches—brown and strong brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep

Permeability: Moderate in the upper part and moderately rapid in the lower part
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Near the surface to 1 foot above the surface at some time from October through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Ensley soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Trenary and Sagola soils on low knolls
• The somewhat poorly drained Solona soils in the slightly higher landscape positions
• The very poorly drained Cathro soils in landscape positions similar to those of the Ensley soil

Similar inclusions:
• Soils that are loamy fine sand in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 3c
Primary habitat type: FI
Secondary habitat type: TTS

77B—Vilas loamy sand, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Shape of areas: Irregular
Size of areas: 10 to 1,500 acres

Typical Profile

Surface layer:
0 to 4 inches—dark reddish brown loamy sand
Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand
Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand
Substratum:
24 to 60 inches—brown and light brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Vilas soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres and moderately well drained Croswell soils in low, flat areas
• Karlin and Pence soils, which are less droughty than the Vilas soil; in landscape positions similar to those of the Vilas soil

Similar inclusions:
• Soils that have a surface layer and subsoil of sand
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: None

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6A
Michigan soil management group: 5.3a
Primary habitat type: AQV

Secondary habitat type: None assigned

77D—Vilas loamy sand, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Surface layer:
0 to 4 inches—dark reddish brown loamy sand
Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand
Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand
Substratum:
24 to 60 inches—brown and light brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Vilas soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres and moderately well drained Croswell soils in low, flat areas
- Karlin and Pence soils, which are less droughty than the Vilas soil; in landscape positions similar to those of the Vilas soil

Similar inclusions:
- Soils that have a surface layer and subsoil of sand
- Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on landings

Management measures:
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 6A
Michigan soil management group: 5.3a
Primary habitat type: AQV
Secondary habitat type: None assigned

78B—Vilas-Karlin complex, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Vilas

Surface layer:
0 to 4 inches—dark reddish brown loamy sand
Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand
Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand
Substratum:
24 to 60 inches—brown and light brown sand

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand
Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Vilas—rapid; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Vilas—excessively drained; Karlin—somewhat excessively drained

Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Vilas soil and similar soils: 40 to 60 percent
Karlin soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils and the moderately well drained Croswell and Karlin, moderately wet, soils in low, flat areas
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a surface layer and subsoil of sand
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: None

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Vilas—6A; Karlin—3A
Michigan soil management group: Vilas—5.3a; Karlin—4a
Primary habitat type: AQV
Secondary habitat type: TMV

78D—Vilas-Karlin complex, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Vilas

Surface layer:
0 to 4 inches—dark reddish brown loamy sand

Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand

Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand

Substratum:
24 to 60 inches—brown and light brown sand

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Vilas—rapid; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Vilas—excessively drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Vilas soil and similar soils: 40 to 60 percent
Karlin soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils and the moderately well drained Croswell and Karlin, moderately wet, soils in low, flat areas
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a substratum of loamy sand
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIs

Woodland ordination symbol: Vilas—6A; Karlin—3A
Michigan soil management group: Vilas—5.3a; Karlin—4a
Primary habitat type: AQV
Secondary habitat type: TMV

78F—Vilas-Karlin complex, 18 to 35 percent slopes

Setting

Landform and position on the landform: Hilly areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Vilas

Surface layer:
0 to 4 inches—dark reddish brown loamy sand

Subsurface layer:
4 to 5 inches—dark reddish gray loamy sand

Subsoil:
5 to 17 inches—dark reddish brown and dark brown, very friable loamy sand
17 to 24 inches—dark brown, loose sand

Substratum:
24 to 60 inches—brown and light brown sand

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Vilas—rapid; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Vilas—excessively drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Vilas soil and similar soils: 45 to 60 percent
Karlin soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
- Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils
- Soils that have slopes of 35 to 50 percent

Similar inclusions:
- Soils that have a substratum of loamy sand
- Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
- Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Vilas—6R; Karlin—3R
Michigan soil management group: Vilas—5.3a; Karlin—4a
Primary habitat type: AQV
Secondary habitat type: TMV

79A—Fence silt loam, 1 to 2 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains and ground moraines
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray silt loam

Subsurface layer:
2 to 5 inches—brown silt loam

Subsoil:
5 to 9 inches—dark brown, friable silt loam
9 to 41 inches—brown and reddish brown, mottled, firm and friable silt loam

Substratum:
41 to 60 inches—reddish brown, mottled very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Fence soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Gaastra soils in the lower landscape positions
• Stambaugh soils, which have a substratum of gravelly sand; in landscape positions similar to those of the Fence soil
• Wabeno soils, which have a shallower rooting depth than the Fence soil; in landscape positions similar to those of the Fence soil

Similar inclusions:
• Soils that are well drained
• Soils that have slopes of 2 to 6 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, low organic matter content, seasonal wetness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Generally, only low areas and drainageways need tile drainage, but some level areas may need a grid system of tile drainage.
• Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: I
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: AVO
Secondary habitat type: AOC

79B—Fence silt loam, 2 to 6 percent slopes

Setting

Landform and position on the landform: Undulating areas on outwash plains and ground moraines
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray silt loam

Subsurface layer:
2 to 5 inches—brown silt loam

Subsoil:
5 to 9 inches—dark brown, friable silt loam
9 to 41 inches—brown and reddish brown, mottled, firm and friable silt loam

Substratum:
41 to 60 inches—reddish brown, mottled very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Fence soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Gaastra soils in the lower landscape positions
- Stambaugh soils that have a substratum of gravelly sand; in landscape positions similar to those of the Fence soil
- Wabeno soils, which have a shallower rooting depth than the Fence soil; in landscape positions similar to those of the Fence soil

Similar inclusions:
- Soils that are well drained

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
- The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal wetness, tilth

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Generally, only low areas and drainageways need tile drainage, but some level areas may need a grid system of tile drainage.
- Subsurface drainage systems should be designed so that the rate of flowing water helps to keep fine sand and silt from plugging the tile lines. Also, suitable filtering material may be needed to keep the silt and fine sand from flowing into the tile lines.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: AVO
Secondary habitat type: AOC

79D—Fence silt loam, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains and ground moraines
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray silt loam

Subsurface layer:
2 to 5 inches—brown silt loam

Subsoil:
5 to 9 inches—dark brown, friable silt loam
9 to 41 inches—brown and reddish brown, firm and friable silt loam

Substratum:
41 to 60 inches—reddish brown very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Fence soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Gaastra soils on foot slopes and in drainageways
- Stambaugh soils that have a substratum of gravelly sand; in landscape positions similar to those of the Fence soil
- Wabeno soils, which have a shallower rooting depth

than the Fence soil; in landscape positions similar to those of the Fence soil
• Soils that have slopes of 18 to 30 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: AVO
Secondary habitat type: AOC

80B—Pence fine sandy loam, 1 to 6 percent slopes

Setting

Landform: Nearly level and undulating areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular
Size of areas: 5 to 1,200 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam
Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand
Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Pence soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in the lower landscape positions
• Sundog and Padus soils, which are less droughty than the Pence soil; in landscape positions similar to those of the Pence soil
• Vilas soils, which are more droughty than the Pence soil; in landscape positions similar to those of the Pence soil

Similar inclusions:
• Soils that have a substratum of sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management,

stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: AQV

80D—Pence fine sandy loam, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 400 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam
Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand
Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Pence soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in drainageways and depressions
• Sundog, Sarona, and Padus soils, which are less droughty than the Pence soil; on foot slopes and in low, flat areas
• Vilas soils, which are more droughty than the Pence soil; in landscape positions similar to those of the Pence soil

Similar inclusions:
• Soils that have a substratum of sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops

increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: AQV

80F—Pence fine sandy loam, 18 to 35 percent slopes

Setting

Landform and position on the landform: Hilly areas on outwash plains, stream terraces, and eskers
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 40 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam
Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand
Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Pence soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in drainageways and depressions
• Sundog, Sarona, and Padus soils, which are less droughty than the Pence soil; on foot slopes and in low, flat areas
• Vilas soils, which are more droughty than the Pence soil; in landscape positions similar to those of the Pence soil
Similar inclusions:
• Soils that have a substratum of sand

Use and Management

Land use: Woodland
Major management concerns: Erosion hazard, equipment limitation
Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: AQV

82B—Keweenaw loamy fine sand, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular

Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 6 inches—brown loamy fine sand

Subsoil:
6 to 33 inches—yellowish red, very friable loamy fine sand and loamy sand
33 to 39 inches—brown and dark reddish brown, friable loamy sand and sandy loam
39 to 60 inches—strong brown, very friable loamy sand with bands of yellowish red sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Keweenaw soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing and Au Gres soils in the lower landscape positions
• Sarona soils, which are less droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil
• Pence and Karlin soils, which are more droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

82D—Keweenaw loamy fine sand, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 6 inches—brown loamy fine sand

Subsoil:
6 to 33 inches—yellowish red, very friable loamy fine sand and loamy sand
33 to 39 inches—brown and dark reddish brown, friable loamy sand and sandy loam
39 to 60 inches—strong brown, very friable loamy sand with bands of yellowish red sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Keweenaw soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing and Au Gres soils on foot slopes and in drainageways
• Sarona soils, which are less droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil
• Pence and Karlin soils, which are more droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

82F—Keweenaw loamy fine sand, 18 to 35 percent slopes

Setting

Landform and position on the landform: Hilly areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 6 inches—brown loamy fine sand

Subsoil:
6 to 33 inches—yellowish red, very friable loamy fine sand and loamy sand
33 to 39 inches—brown and dark reddish brown, friable loamy sand and sandy loam
39 to 60 inches—strong brown, very friable loamy sand with bands of yellowish red sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate or moderately rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Keweenaw soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing and Au Gres soils on foot slopes and in drainageways
• Areas that have slopes of 35 to 45 percent
• Sarona soils, which are less droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil
• Pence and Karlin soils, which are more droughty than the Keweenaw soil; in landscape positions similar to those of the Keweenaw soil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping

or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

100B—Keweenaw-Karlin complex, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Keweenaw

Surface layer:
0 to 1 inch—black loamy fine sand
Subsurface layer:
1 to 6 inches—brown loamy fine sand
Subsoil:
6 to 33 inches—yellowish red, very friable loamy fine sand and loamy sand
33 to 39 inches—brown and dark reddish brown, friable loamy sand and sandy loam
39 to 60 inches—strong brown, very friable loamy sand with bands of yellowish red sandy loam

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand
Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Keweenaw—moderate or moderately rapid; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Keweenaw—well drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Keweenaw soil and similar soils: 50 to 55 percent
Karlin soil and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils
• The moderately well drained Croswell soils and the moderately well drained, moderately wet Karlin soils; in drainageways
Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness
Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop

residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Keweenaw—3A; Karlin—3A
Michigan soil management group: Keweenaw—4a-a; Karlin—4a
Primary habitat type: TM
Secondary habitat type: TMV

100D—Keweenaw-Karlin complex, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 700 acres

Typical Profile

Keweenaw

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 6 inches—brown loamy fine sand

Subsoil:
6 to 33 inches—yellowish red, very friable loamy fine sand and loamy sand
33 to 39 inches—brown and dark reddish brown, friable loamy sand and sandy loam
39 to 60 inches—strong brown, very friable loamy sand with bands of yellowish red sandy loam

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Keweenaw—moderate or moderately rapid; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Keweenaw—well drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Keweenaw soil and similar soils: 50 to 60 percent
Karlin soil and similar soils: 30 to 40 percent
Contrasting inclusions: 10 percent

Inclusions

Contrasting inclusions:
• Sarona soils, which are less droughty than the major soils; in landscape positions similar to those of the major soils
• The somewhat poorly drained Channing and Au Gres soils on foot slopes and in drainageways
• Areas that have slopes of 18 to 30 percent

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization

structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Keweenaw—3A; Karlin—3A
Michigan soil management group: Keweenaw—4a-a; Karlin—4a
Primary habitat type: TM
Secondary habitat type: TMV

101B—Trenary-Solona complex, 0 to 6 percent slopes, stony

Setting

Landform and position on the landform: Trenary—undulating areas on ground moraines; Solona—drainageways on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Trenary

Surface layer:
0 to 4 inches—black fine sandy loam

Subsurface layer:
4 to 5 inches—brown fine sandy loam

Subsoil:
5 to 12 inches—dark brown, friable fine sandy loam
12 to 23 inches—dark reddish brown and brown, firm sandy loam and loamy sand
23 to 36 inches—dark reddish brown and reddish brown, friable loam and loamy sand

Substratum:
36 to 60 inches—reddish brown sandy loam

Solona

Surface layer:
0 to 6 inches—black very fine sandy loam

Subsurface layer:
6 to 12 inches—brown, mottled very fine sandy loam

Subsoil:
12 to 30 inches—brown, mottled, friable very fine sandy loam
30 to 36 inches—yellowish red and brown, friable loam and loamy sand

Substratum:
36 to 60 inches—yellowish red sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Trenary—well drained; Solona—somewhat poorly drained
Seasonal high water table: Trenary—at a depth of more than 6 feet; Solona—1 to 3 feet below the surface at some time from March through July
Surface runoff: Slow
Flooding: None

Composition

Trenary soil and similar soils: 50 to 65 percent
Solona soil and similar soils: 25 to 35 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Escanaba and Karlin soils, which are coarser textured than the major soils; in landscape positions similar to those of the major soils
• The poorly drained Witbeck and very poorly drained Cathro soils in depressions

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Trenary—equipment limitation; Solona—equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods in areas of the Trenary soil. Access is easiest during periods in winter when access roads are frozen.
• The seasonal high water table in areas of the Solona soil restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel.

Culverts are needed to maintain the natural drainage system.
• Windthrow in areas of the Solona soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Trenary—soil blowing, water erosion, low organic matter content, and tilth; Solona—soil blowing, seasonal wetness, and tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• In areas of the Trenary soil, conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• In areas of the Trenary soil, contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• In areas of the Trenary soil, no-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Using tile drains in areas of the Solona soil can reduce wetness if a suitable outlet is available.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Trenary—3L; Solona—3W
Michigan soil management group: Trenary—3a; Solona—3b
Primary habitat type: ATD
Secondary habitat type: TMC

102B—Escanaba loamy fine sand, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 1 inch—black loamy fine sand

Subsurface layer:
1 to 9 inches—reddish gray loamy fine sand

Subsoil:
9 to 28 inches—dark reddish brown and strong brown, very friable and friable loamy fine sand
28 to 36 inches—reddish brown and dark reddish gray, firm fine sandy loam and loamy fine sand
36 to 49 inches—dark reddish brown, friable fine sandy loam

Substratum:
49 to 60 inches—reddish brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and moderate in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Escanaba soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin soils, which are more droughty than the Escanaba soil; in landscape positions similar to those of the Escanaba soil
• Trenary soils, which are less droughty than the Escanaba soil; in landscape positions similar to those of the Escanaba soil
• The moderately well drained, moderately wet Karlin soils in low, flat areas

Similar inclusions:
• Soils that have slopes of 6 to 12 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, seedling mortality

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate.

Replanting is needed in some areas.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3S
Michigan soil management group: 4/2a
Primary habitat type: TM
Secondary habitat type: None assigned

103B—Wabeno-Sarona complex, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown, friable silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Sarona—moderate
Available water capacity: Moderate
Drainage class: Wabeno—moderately well drained; Sarona—well drained
Seasonal high water table: Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Sarona—at a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 40 to 55 percent
Sarona soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils in drainageways and on foot slopes
• Keweenaw and Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils
• Areas where 1 to 3 percent of the surface is covered with stones and cobbles

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Wabeno—equipment

limitation, windthrow hazard; Sarona—equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Wabeno—3L; Sarona—3L
Michigan soil management group: Wabeno—2a-af; Sarona—3a
Primary habitat type: AVO
Secondary habitat type: ATD

103D—Wabeno-Sarona complex, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown, friable silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Sarona—moderate
Available water capacity: Moderate
Drainage class: Wabeno—moderately well drained; Sarona—well drained
Seasonal high water table: Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Sarona—at a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Wabeno soil and similar soils: 40 to 55 percent
Sarona soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Net soils in drainageways
- Keweenaw and Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils
- Areas where 1 to 3 percent of the surface is covered with stones and cobbles
- The poorly drained Witbeck soils in depressions
- Soils that have slopes of 18 to 30 percent

Similar inclusions:
- Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Wabeno—equipment limitation, windthrow hazard; Sarona—equipment limitation

Management measures:
- The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
- Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Wabeno—3L; Sarona—3L
Michigan soil management group: Wabeno—2a-af; Sarona—3a
Primary habitat type: AVO
Secondary habitat type: ATD

104A—Stambaugh silt loam, 1 to 2 percent slopes, stony

Setting

Landform and position on the landform: Nearly level areas on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray silt loam

Subsoil:
4 to 22 inches—dark brown, brown, and yellowish brown, friable silt loam and very fine sandy loam
22 to 39 inches—reddish brown and brown, mottled, firm silt loam

Substratum:
39 to 60 inches—dark brown very gravelly sand and reddish brown gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderately slow in the upper part and rapid in the lower part
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2.5 to 5.0 feet below the surface at some time from November through April
Surface runoff: Slow
Flooding: None

Composition

Stambaugh soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- Wabeno soils, which have a shallower rooting depth

than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• Fence soils, which have a substratum of very fine sandy loam; in landscape positions similar to those of the Stambaugh soil
• The well drained Padus soils, which are more droughty than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• The somewhat poorly drained Gaastra soils in the slightly lower landscape positions

Similar inclusions:
• Soils that have slopes of 2 to 6 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3L
Michigan soil management group: 3/5a-a
Primary habitat type: AVO
Secondary habitat type: None assigned

104B—Stambaugh silt loam, 2 to 6 percent slopes, stony

Setting

Landform and position on the landform: Undulating areas on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray silt loam

Subsoil:
4 to 22 inches—dark brown, brown, and yellowish brown, friable silt loam and very fine sandy loam
22 to 39 inches—reddish brown and brown, firm silt loam

Substratum:
39 to 60 inches—dark brown very gravelly sand and reddish brown gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderately slow in the upper part and rapid in the lower part
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Stambaugh soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Wabeno soils, which have a shallower rooting depth than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• Fence soils, which have a substratum of very fine sandy loam; in landscape positions similar to those of the Stambaugh soil
• The well drained Padus soils, which are more droughty than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• The somewhat poorly drained Gaastra soils in the slightly lower landscape positions

Use and Management

Land use: Dominant uses—woodland (fig. 7), cropland



Figure 7.—A mature stand of sugar maple in an area of Stambaugh silt loam, 2 to 6 percent slopes, stony.

Woodland

Major management concerns: Equipment limitation

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.

• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.

• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3L
Michigan soil management group: 3/5a-a
Primary habitat type: AVO
Secondary habitat type: None assigned

104D—Stambaugh silt loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray silt loam

Subsoil:
4 to 22 inches—dark brown, brown, and yellowish brown, friable silt loam and very fine sandy loam
22 to 39 inches—reddish brown and brown, firm silt loam

Substratum:
39 to 60 inches—dark brown very gravelly sand and reddish brown gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderately slow in the upper part and rapid in the lower part
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Stambaugh soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils, which have a shallower rooting depth than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• The moderately well drained Fence soils that have a substratum of very fine sandy loam; in landscape positions similar to those of the Stambaugh soil
• Padus soils, which are more droughty than the Stambaugh soil; in landscape positions similar to those of the Stambaugh soil
• The somewhat poorly drained Gaastra soils on foot slopes and in drainageways
• Areas that have slopes of 18 to 30 percent

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3L
Michigan soil management group: 3/5a-a
Primary habitat type: AVO
Secondary habitat type: None assigned

105D—Wabeno-Rock outcrop complex, 1 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Nearly level to rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Wabeno

Surface layer:
0 to 2 inches—black silt loam
Subsurface layer:
2 to 4 inches—brown silt loam
Subsoil:
4 to 23 inches—dark brown and brown, friable silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam
Substratum:
50 to 60 inches—brown sandy loam

Soil Properties and Qualities

Wabeno

Depth class: Very deep
Rock fragments on the surface: Kind—stones and

cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet at some time from October through June
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 65 to 80 percent
Rock outcrop: 10 to 20 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Sundog and Karlin soils, which are more droughty than the Wabeno soil; in landscape positions similar to those of the Wabeno soil

Similar inclusions:
• Soils that are less than 60 inches deep over bedrock
• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• The areas of Rock outcrop should be considered when road locations and landing sites are planned.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3L
Michigan soil management group: 2a-af
Primary habitat type: TM
Secondary habitat type: ATD

106D—Champion very fine sandy loam, 1 to 18 percent slopes, rocky, very stony

Setting

Landform and position on the landform: Nearly level to rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—gray very fine sandy loam

Subsoil:
4 to 11 inches—dark brown and dark reddish brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam

Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Champion soil and similar soils: 85 to 95 percent
Rock outcrop: 1 to 10 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin soils, which are more droughty than the Champion soil; in landscape positions similar to those of the Champion soil
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:

- Equipment should be used only during periods when the soil is relatively dry or has an adequate snow cover.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
- Rock outcrops should be considered when road locations and landing sites are planned.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

107B—Sarona fine sandy loam, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray fine sandy loam
Subsurface layer:
2 to 7 inches—brown fine sandy loam
Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam
Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sarona soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Net soils in the lower landscape positions
- Keweenaw and Karlin soils, which are more droughty than the Sarona soil; in landscape positions similar to those of the Sarona soil
- The moderately well drained Wabeno soils, which have a shallower rooting depth than the Sarona soil; in landscape positions similar to those of the Sarona soil

Similar inclusions:

- Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:

- The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in

the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: ATD
Secondary habitat type: TM

107D—Sarona fine sandy loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Sarona soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Keweenaw and Karlin soils, which are more droughty than the Sarona soil; in landscape positions similar to those of the Sarona soil
• Wabeno soils, which have a shallower rooting depth than the Sarona soil; in landscape positions similar to those of the Sarona soil

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, slope

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe

Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: ATD
Secondary habitat type: TM

107F—Sarona fine sandy loam, 18 to 35 percent slopes, stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Sarona soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Keweenaw and Karlin soils, which are more droughty than the Sarona soil; in landscape positions similar to those of the Sarona soil
• Wabeno soils, which have a shallower rooting depth than the Sarona soil; in landscape positions similar to those of the Sarona soil

Similar inclusions:
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3a
Primary habitat type: ATD
Secondary habitat type: TM

108D—Sarona-Rock outcrop complex, 1 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Nearly level to rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Sarona

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sarona soil and similar soils: 65 to 80 percent
Rock outcrop: 10 to 20 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils, which have a shallower rooting depth than the Sarona soil; in landscape positions similar to those of the Sarona soil
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Karlin and Keweenaw soils, which are more droughty than the Sarona soil; in landscape positions similar to those of the Sarona soil

Similar inclusions:
• Soils that are less than 60 inches deep over bedrock
• Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• The areas of Rock outcrop should be considered when road locations and landing sites are planned.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3L
Michigan soil management group: 3a
Primary habitat type: TM
Secondary habitat type: TMV

108F—Sarona-Rock outcrop complex, 18 to 35 percent slopes, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Soil Properties and Qualities

Sarona

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Sarona soil and similar soils: 65 to 80 percent
Rock outcrop: 10 to 15 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils, which have a shallower rooting depth than the Sarona soil; in landscape positions similar to those of the Sarona soil
• The somewhat poorly drained Net soils in drainageways and on foot slopes
• Karlin and Keweenaw soils, which are more droughty than the Sarona soil; in landscape positions similar to those of the Sarona soil

Similar inclusions:
- Soils that are less than 60 inches deep over bedrock
- Soils that have gravelly sand at a depth of 40 to 60 inches

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
- Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
- The areas of Rock outcrop should be considered when road locations and landing sites are planned.
- Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.

Interpretive Groups

Land capability classification: VIIIs
Woodland ordination symbol: 3R
Michigan soil management group: 3a
Primary habitat type: TM
Secondary habitat type: TMV

109D—Udorthents, nearly level to rolling

Setting

Landform and position on the landform: Nearly level to rolling areas on moraines that formerly were excavated for borrow material and that have been filled
Slope: 0 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Soil Properties and Qualities

Texture: 10 inches of strong brown gravelly sandy loam over loamy and gravelly material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow to rapid
Flooding: None

Composition

Udorthents and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- Somewhat poorly drained and poorly drained soils in the lower positions on the landscape

Use and Management

Land use: Former use—woodland; current uses—none

Management measures:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Habitat type: None assigned

110B—Petticoat-Wabeno silt loams, 1 to 6 percent slopes, very stony

Setting

Landform: Nearly level and undulating ground moraines
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Petticoat

Surface layer:
0 to 1 inch—black silt loam

Subsurface layer:
1 to 4 inches—reddish gray silt loam

Subsoil:
4 to 20 inches—dark reddish brown and dark brown, friable silt loam
20 to 38 inches—brown and dark brown, mottled, friable and firm silt loam and loam

Substratum:
38 to 60 inches—brown gravelly loamy sand

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown, friable silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Petticoat—moderate in the upper part and rapid in the lower part; Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Petticoat—1.5 to 4.0 feet below the surface at some time from November through May; Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from November through June
Surface runoff: Slow
Flooding: None

Composition

Petticoat soil and similar soils: 40 to 55 percent
Wabeno soil and similar soils: 40 to 55 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils in drainageways and on foot slopes
• Sundog soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils

Use and Management

Land use: Woodland

Major management concerns: Petticoat—equipment limitation; Wabeno—equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Petticoat—3L; Wabeno—3L
Michigan soil management group: Petticoat—3/5a; Wabeno—2a-af
Primary habitat type: AVO
Secondary habitat type: ATD

110D—Petticoat-Wabeno silt loams, 6 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Rolling areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Petticoat

Surface layer:
0 to 1 inch—black silt loam

Subsurface layer:
1 to 4 inches—reddish gray silt loam

Subsoil:
4 to 20 inches—dark reddish brown and dark brown, friable silt loam
20 to 38 inches—brown and dark brown, friable and firm silt loam and loam

Substratum:
38 to 60 inches—brown gravelly loamy sand

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown, friable silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep

Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Petticoat—moderate in the upper part and rapid in the lower part; Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Petticoat—well drained; Wabeno—moderately well drained
Seasonal high water table: Petticoat—at a depth of more than 6 feet; Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from November through June
Surface runoff: Medium
Flooding: None

Composition

Petticoat soil and similar soils: 45 to 55 percent
Wabeno soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in depressions
• Sundog soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils
• Areas that have slopes of 18 to 35 percent

Use and Management

Land use: Woodland

Major management concerns: Petticoat—equipment limitation; Wabeno—equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Large stones on the surface can hinder harvesting operations and damage equipment.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Petticoat—3L; Wabeno—3L
Michigan soil management group: Petticoat—3/5a; Wabeno—2a-af
Primary habitat type: AVO
Secondary habitat type: ATD

111B—Champion-Net very fine sandy loams, 0 to 6 percent slopes, very stony

Setting

Landform and position on the landform: Champion—nearly level and undulating areas on ground moraines and end moraines; Net—drainageways on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Champion

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—gray very fine sandy loam
Subsoil:
4 to 11 inches—dark reddish brown and dark brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam
Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Net

Surface layer:
0 to 3 inches—dark brown very fine sandy loam
Subsurface layer:
3 to 6 inches—brown, mottled very fine sandy loam
Subsoil:
6 to 28 inches—dark brown, mottled, friable very fine sandy loam and fine sandy loam
28 to 49 inches—a fragipan of dark brown and brown, mottled, very firm gravelly sandy loam and gravelly loamy sand
Substratum:
49 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Champion—moderate in the upper part,

very slow in the fragipan, and moderate or moderately rapid in the lower part; Net—moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Champion—moderately well drained; Net—somewhat poorly drained
Seasonal high water table: Champion—perched at a depth of 1 to 2 feet at some time from November through May; Net—perched at a depth of 0.5 foot to 1.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Champion soil and similar soils: 50 to 65 percent
Net soil and similar soils: 25 to 35 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin and Sundog soils, which are more droughty than the major soils; in landscape positions similar to those of the Champion soil
• The poorly drained Witbeck soils in depressions
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Champion—equipment limitation and windthrow hazard; Net—equipment limitation, seedling mortality, and windthrow hazard

Management measures:
• The seasonal high water table in areas of the Net soil restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Special site preparation, such as bedding, can reduce the seedling mortality rate in areas of the Net soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Champion—3W; Net—3W
Michigan soil management group: Champion—3a-af; Net—3b-af
Primary habitat type: ATD
Secondary habitat type: TMC

112B—Sundog very fine sandy loam, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains, eskers, stream terraces, moraines, and crevasse fillings
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 4 inches—dark brown very fine sandy loam

Subsurface layer:
4 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 15 inches—dark reddish brown and dark brown, friable very fine sandy loam
15 to 22 inches—brown, friable gravelly very fine sandy loam

Substratum:
22 to 43 inches—brown sand with bands of loamy sand
43 to 60 inches—brown very gravelly sand with pockets of very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sundog soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in the lower landscape positions
• Karlin and Pence soils, which are more droughty than the Sundog soil; in landscape positions similar to those of the Sundog soil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.

• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 2L
Michigan soil management group: 3/5a
Primary habitat type: TMV
Secondary habitat type: TM

112D—Sundog very fine sandy loam, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains, eskers, stream terraces, moraines, and crevasse fillings
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—dark brown very fine sandy loam

Subsurface layer:
4 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 15 inches—dark reddish brown and dark brown, friable very fine sandy loam
15 to 22 inches—brown, friable gravelly very fine sandy loam

Substratum:
22 to 43 inches—brown sand with bands of loamy sand
43 to 60 inches—brown very gravelly coarse sand with pockets of very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Sundog soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:

• Karlin and Pence soils, which are more droughty than the Sundog soil; in landscape positions similar to those of the Sundog soil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops

increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 2L
Michigan soil management group: 3/5a
Primary habitat type: TMV
Secondary habitat type: TM

112F—Sundog cobbly fine sandy loam, 18 to 50 percent slopes, stony

Setting

Landform and position on the landform: Hilly to very steep areas on outwash plains, eskers, stream terraces, moraines, and crevasse fillings
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown cobbly fine sandy loam

Subsurface layer:
5 to 8 inches—reddish gray cobbly fine sandy loam

Subsoil:
8 to 16 inches—reddish brown and brown, friable gravelly fine sandy loam
16 to 24 inches—brown, firm very gravelly loamy sand

Substratum:
24 to 60 inches—brown very gravelly coarse sand and yellowish brown gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—cobbles and stones; percentage of surface covered—0.01 to 1.0
Permeability: Moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe

Composition

Sundog soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin and Pence soils, which are more droughty than the Sundog soil; in landscape positions similar to those of the Sundog soil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 2R
Michigan soil management group: 3/5a
Primary habitat type: TMV
Secondary habitat type: TM

113A—Sundog very fine sandy loam, moderately wet, 0 to 3 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains, stream terraces, moraines, and crevasse fillings
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Surface layer:
0 to 2 inches—dark reddish brown very fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray very fine sandy loam

Subsoil:
3 to 18 inches—dark reddish brown and dark brown, friable very fine sandy loam
18 to 25 inches—brown, mottled, friable very fine sandy loam
Substratum:
25 to 60 inches—brown very gravelly sand and gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 2.5 to 6.0 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Sundog soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in the lower positions on the landscape
• Karlin, Croswell, and Manitowish soils, which are more droughty than the Sundog soil; in landscape positions similar to those of the Sundog soil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 4L
Michigan soil management group: 3/5a
Primary habitat type: TMC-Vac
Secondary habitat type: TMV

114A—Minocqua-Channing complex, 0 to 3 percent slopes

Setting

Landform and position on the landform: Minocqua—depressions on outwash plains and stream terraces; Channing—drainageways on outwash plains and stream terraces
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Minocqua

Surface layer:
0 to 4 inches—black muck
Subsurface layer:
4 to 6 inches—very dark gray silt loam
Subsoil:
6 to 25 inches—gray, mottled, friable loam
25 to 29 inches—grayish brown, friable loamy coarse sand
Substratum:
29 to 60 inches—dark grayish brown, stratified coarse sand and gravelly coarse sand

Channing

Surface layer:
0 to 4 inches—dark brown very fine sandy loam
Subsurface layer:
4 to 6 inches—gray very fine sandy loam
Subsoil:
6 to 15 inches—dark reddish brown and dark brown, friable very fine sandy loam
15 to 22 inches—brown, friable gravelly very fine sandy loam
Substratum:
22 to 43 inches—brown sand with bands of loamy sand
43 to 60 inches—brown very gravelly sand with pockets of very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep

Permeability: Minocqua—moderate in the upper part and rapid or very rapid in the lower part; Channing—moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Minocqua—moderate; Channing—low
Drainage class: Minocqua—poorly drained; Channing—somewhat poorly drained
Seasonal high water table: Minocqua—1 foot above to 1 foot below the surface at some time from November through May; Channing—0.5 foot to 1.5 feet below the surface at some time from November through May
Surface runoff: Minocqua—very slow or ponded; Channing—slow
Flooding: None

Composition

Minocqua soil and similar soils: 50 to 65 percent
Channing soil and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained, organic Cathro soils in landscape positions similar to those of the major soils
• The moderately well drained Sundog soils on low ridges

Similar inclusions:
• Areas where 0.01 to 1.0 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Minocqua soil.
• In areas of the Channing soil, special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Minocqua—7W; Channing—2W
Michigan soil management group: Minocqua—4c; Channing—3/5b
Primary habitat type: TTS
Secondary habitat type: PCS

115A—Manitowish fine sandy loam, 0 to 3 percent slopes

Setting

Landform and position on the landform: Nearly level areas on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray fine sandy loam

Subsurface layer:
1 to 4 inches—brown fine sandy loam

Subsoil:
4 to 19 inches—dark brown and dark yellowish brown, friable fine sandy loam
19 to 26 inches—dark yellowish brown, very friable gravelly loamy sand

Substratum:
26 to 60 inches—yellowish brown, mottled, stratified gravelly sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 3 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Manitowish soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Channing soils in the slightly lower positions on the landscape

Similar inclusions:
• Areas that are well drained
• Soils that have a substratum of sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Seedling mortality

Management measures:

• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.

Cropland

Major management concerns: Soil blowing, low organic matter content, droughtiness

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.

• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.

• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

• A system of conservation tillage that leaves crop residue on the surface conserves moisture.

• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3S
Michigan soil management group: 4a
Primary habitat type: TMV
Secondary habitat type: TM

116B—Wabeno silt loam, 1 to 6 percent slopes, very stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular, oval, or long and narrow
Size of areas: 5 to 600 acres

Typical Profile

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet at some time from November through June
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Net soils in the lower landscape positions

• Sundog and Karlin soils, which are more droughty than the Wabeno soil; in landscape positions similar to those of the Wabeno soil

• The well drained Stambaugh soils, which have a substratum of gravelly sand; in landscape positions similar to those of the Wabeno soil

Similar inclusions:

• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:

• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced

speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3L
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: AOC

116D—Wabeno silt loam, 6 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 800 acres

Typical Profile

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet at some time from November through June
Surface runoff: Medium
Flooding: None

Composition

Wabeno soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Sundog and Karlin soils, which are more droughty than the Wabeno soil; in landscape positions similar to those of the Wabeno soil
• The well drained Stambaugh soils, which have a substratum of gravelly sand; in landscape positions similar to those of the Wabeno soil

Similar inclusions:
• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3L
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: AOC

121B—Peavy silt loam, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—dark reddish brown silt loam

Subsoil:
6 to 27 inches—dark reddish brown and reddish brown, mottled, friable very fine sandy loam and fine sandy loam

27 to 41 inches—dark reddish brown, very firm channery loam

Substratum:

41 to 70 inches—dark reddish brown channery sandy loam

Soil Properties and Qualities

Depth class: Moderately deep or deep to dense till
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate in the upper part and slow or very slow in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet at some time from November through April
Surface runoff: Slow
Flooding: None

Composition

Peavy soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Net soils in the lower landscape positions
- Padus soils, which are more droughty than the Peavy soil; in landscape positions similar to those of the Peavy soil
- Areas that have rock outcrops

Similar inclusions:

- Soils that have a substratum of gravelly loamy sand
- Soils that do not have a firm layer in the subsoil or substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:

- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:

- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
- Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3W
Michigan soil management group: 3/2a-d
Primary habitat type: AVO
Secondary habitat type: ATD

121D—Peavy silt loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:

0 to 6 inches—dark reddish brown silt loam

Subsoil:

6 to 27 inches—dark reddish brown and reddish brown, friable very fine sandy loam and fine sandy loam
27 to 41 inches—dark reddish brown, very firm channery loam

Substratum:

41 to 70 inches—dark reddish brown channery sandy loam

Soil Properties and Qualities

Depth class: Moderately deep or deep to dense till
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Moderate in the upper part and slow or

very slow in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Peavy soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Padus soils, which are more droughty than the Peavy soil; in landscape positions similar to those of the Peavy soil
• Areas that have rock outcrops

Similar inclusions:
• Soils that have a substratum of gravelly loamy sand
• Soils that do not have a firm layer in the subsoil or substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3D
Michigan soil management group: 3/2a-d
Primary habitat type: AVO
Secondary habitat type: ATD

122B—Sarona-Karlin fine sandy loams, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Sarona—moderate; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Sarona—moderate; Karlin—low
Drainage class: Sarona—well drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sarona soil and similar soils: 40 to 55 percent
Karlin soil and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres and Net soils in the lower landscape positions
- The excessively drained Vilas soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils
- The moderately well drained Wabeno soils, which have a shallower rooting depth than the major soils; in landscape positions similar to those of the major soils
- The moderately well drained, moderately wet Karlin soils in the slightly lower landscape positions

Similar inclusions:
- Soils that have gravelly sand at a depth of 40 to 60 inches
- Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation in areas of the Sarona soil

Management measures:
- The use of equipment is briefly restricted in spring and during other excessively wet periods in areas of the Sarona soil. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth, and droughtiness in areas of the Karlin soil

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
- Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.
- In areas of the Karlin soil, a system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
- In areas of the Karlin soil, irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Sarona—3L; Karlin—3A
Michigan soil management group: Sarona—3a; Karlin—4a
Primary habitat type: TM
Secondary habitat type: TMV

122D—Sarona-Karlin fine sandy loams, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Sarona

Surface layer:
0 to 2 inches—very dark gray fine sandy loam

Subsurface layer:
2 to 7 inches—brown fine sandy loam

Subsoil:
7 to 33 inches—dark brown and brown, friable fine sandy loam and loamy fine sand
33 to 37 inches—dark brown, friable loam

Substratum:
37 to 60 inches—reddish brown gravelly sandy loam

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 10 inches—brown, friable fine sandy loam
10 to 35 inches—brown and yellowish red, friable and very friable sandy loam and loamy sand

Substratum:
35 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—0.01 to 0.1
Permeability: Sarona—moderate; Karlin—moderately rapid in the upper part, rapid in the lower part
Available water capacity: Sarona—moderate; Karlin—low
Drainage class: Sarona—well drained; Karlin—somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sarona soil and similar soils: 40 to 55 percent
Karlin soil and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Channing and Net soils on foot slopes and in drainageways
- The excessively drained Vilas soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils
- The moderately well drained Wabeno soils, which have a shallower rooting depth than the major soils; in landscape positions similar to those of the major soils
- Areas that have slopes of 18 to 25 percent

Similar inclusions:
- Soils that have gravelly sand at a depth of 40 to 60 inches
- Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation in areas of the Sarona soil

Management measures:
- The use of equipment is briefly restricted in spring and during other excessively wet periods in areas of the Sarona soil. Access is easiest during periods in winter when access roads are frozen.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth, and droughtiness in areas of the Karlin soil

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
- Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.
- In areas of the Karlin soil, a system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Sarona—3L; Karlin—3A
Michigan soil management group: Sarona—3a; Karlin—4a
Primary habitat type: TM
Secondary habitat type: TMV

123B—Ocqueoc loamy fine sand, 1 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 3 inches—dark reddish brown loamy fine sand
Subsurface layer:
3 to 5 inches—dark reddish gray loamy fine sand
Subsoil:
5 to 17 inches—dark reddish brown, very friable loamy fine sand
17 to 23 inches—reddish brown, very friable loamy fine sand
Substratum:
23 to 60 inches—reddish brown very fine sand with bands of reddish brown very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the upper part and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Ocqueoc soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Sarona soils, which are less droughty than the Ocqueoc soil; in landscape positions similar to those of the Ocqueoc soil
• The moderately well drained, moderately wet Karlin soils in the lower landscape positions
Similar inclusions:
• Soils that have a substratum of loamy fine sand

Use and Management

Land use: Woodland
Major management concerns: None

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A
Michigan soil management group: 4/2a
Primary habitat type: TM
Secondary habitat type: TMV

123D—Ocqueoc loamy fine sand, 6 to 18 percent slopes

Setting

Landform and position on the landform: Rolling areas on outwash plains
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Surface layer:
0 to 3 inches—dark reddish brown loamy fine sand
Subsurface layer:
3 to 5 inches—dark reddish gray loamy fine sand
Subsoil:
5 to 17 inches—dark reddish brown, very friable loamy fine sand
17 to 23 inches—reddish brown, very friable loamy fine sand
Substratum:
23 to 60 inches—reddish brown very fine sand with bands of reddish brown very fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid in the upper part and moderately slow in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Ocqueoc soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• Sarona soils, which are less droughty than the Ocqueoc soil; in landscape positions similar to those of the Ocqueoc soil
• The moderately well drained, moderately wet Karlin soils in the lower landscape positions
• The somewhat poorly drained Au Gres soils on foot slopes and in drainageways
• Areas that have slopes of 18 to 30 percent

Use and Management

Land use: Woodland

Major management concerns: None

Management measures:

• Although the equipment limitation is slight for most woodland operations, the adjacent nearly level and undulating areas, if available, should be selected as sites for landings.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A
Michigan soil management group: 4/2a
Primary habitat type: TM
Secondary habitat type: TMV

124B—Wabeno-Net silt loams, 0 to 6 percent slopes, very stony

Setting

Landform and position on the landform: Wabeno—nearly level and undulating areas on ground moraines; Net—drainageways on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Net

Surface layer:
0 to 3 inches—dark brown silt loam

Subsurface layer:
3 to 6 inches—brown, mottled silt loam

Subsoil:
6 to 28 inches—dark brown, mottled, friable very fine sandy loam and fine sandy loam
28 to 49 inches—a fragipan of dark brown and brown, mottled, very firm gravelly sandy loam and gravelly loamy sand

Substratum:
49 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Net—moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Wabeno—moderate; Net—low
Drainage class: Wabeno—moderately well drained; Net—somewhat poorly drained
Seasonal high water table: Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Net—perched at a depth of 0.5 foot to 1.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 50 to 65 percent
Net soil and similar soils: 25 to 35 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The poorly drained Witbeck soils in depressions
• Sundog and Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the Wabeno soil

Similar inclusions:

• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Wabeno—equipment limitation, windthrow hazard; Net—equipment limitation, seedling mortality, windthrow hazard

Management measures:

• Equipment should be used only when the soils are relatively dry or have an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table in areas of the Net soil restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or

has an adequate snow cover.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Wabeno—3L; Net—3W
Michigan soil management group: Wabeno—2a-af; Net—3b-af
Primary habitat type: ATD
Secondary habitat type: TMC

125B—Wabeno-Net silt loams, 0 to 6 percent slopes, rocky, very stony

Setting

Landform and position on the landform: Wabeno—nearly level and undulating areas on ground moraines; Net—drainageways on ground moraines
Shape of areas: Irregular
Size of areas: 10 to 350 acres

Typical Profile

Wabeno

Surface layer:
0 to 2 inches—black silt loam
Subsurface layer:
2 to 4 inches—brown silt loam
Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam
Substratum:
50 to 60 inches—brown sandy loam

Net

Surface layer:
0 to 3 inches—dark brown silt loam
Subsurface layer:
3 to 6 inches—brown, mottled silt loam
Subsoil:
6 to 28 inches—dark brown, mottled, friable very fine sandy loam and fine sandy loam
28 to 49 inches—a fragipan of dark brown and brown, mottled, very firm gravelly sandy loam and gravelly loamy sand
Substratum:
49 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percent of surface covered—1 to 3
Permeability: Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Net—moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Wabeno—moderate; Net—low
Drainage class: Wabeno—moderately well drained; Net—somewhat poorly drained
Seasonal high water table: Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Net—perched at a depth of 0.5 foot to 1.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 50 to 65 percent
Net soil and similar soils: 20 to 35 percent
Rock outcrop: 1 to 10 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Witbeck soils in depressions
• Sundog and Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the Wabeno soil
Similar inclusions:
• Areas that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Wabeno—equipment limitation, windthrow hazard; Net—equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The seasonal high water table in areas of the Net soil restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Equipment should be used only when the soils are relatively dry or have an adequate snow cover.
• Year-round logging roads require roadfill and gravel.

Culverts are needed to maintain the natural drainage system.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Rock outcrops should be considered when road locations and landing sites are planned.
• In areas of the Net soil, special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Wabeno—3L; Net—3W
Michigan soil management group: Wabeno—2a-af; Net—3b-af
Primary habitat type: ATD
Secondary habitat type: TMC

126B—Champion very fine sandy loam, 1 to 6 percent slopes, very stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Shape of areas: Irregular, oval
Size of areas: 5 to 500 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—gray very fine sandy loam

Subsoil:
4 to 11 inches—dark reddish brown and dark brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam

Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Champion soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Sundog and Karlin soils, which are more droughty than the Champion soil; in landscape positions similar to those of the Champion soil
• The somewhat poorly drained Net soils in the lower landscape positions
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

126D—Champion very fine sandy loam, 6 to 18 percent slopes, very stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—gray very fine sandy loam

Subsoil:
4 to 11 inches—dark reddish brown and dark brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam

Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Medium
Flooding: None

Composition

Champion soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Sundog and Karlin soils, which are more droughty than the Champion soil; in landscape positions similar to those of the Champion soil
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

126F—Champion very fine sandy loam, 18 to 35 percent slopes, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—gray very fine sandy loam

Subsoil:
4 to 11 inches—dark reddish brown and dark brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam

Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid

Flooding: None

Composition

Champion soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Sundog and Karlin soils, which are more droughty than the Champion soil; in landscape positions similar to those of the Champion soil
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard; equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

127D—Goodman silt loam, 1 to 18 percent slopes, rocky, very stony

Setting

Landform and position on the landform: Nearly level to rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 3 inches—very dark gray silt loam
Subsurface layer:
3 to 5 inches—dark grayish brown silt loam
Subsoil:
5 to 14 inches—dark brown, friable very fine sandy loam
14 to 33 inches—brown and dark brown, friable very fine sandy loam
33 to 49 inches—dark reddish brown, friable fine sandy loam and reddish brown, friable loamy sand
Substratum:
49 to 60 inches—reddish brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—cobbles and stones; percentage of surface covered—1 to 3
Permeability: Moderate
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Goodman soil and similar soils: 85 to 95 percent
Rock outcrop: 1 to 10 percent
Contrasting inclusions: 5 to 14 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Sundog soils, which are more droughty than the Goodman soil; in landscape positions similar to those of the Goodman soil
• The moderately well drained Wabeno soils, which have a shallower rooting depth than the Goodman soil; in landscape positions similar to those of the Goodman soil
• Areas where 3 to 15 percent of the surface is covered with stones and cobbles

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are

available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Rock outcrops should be considered when road locations and landing sites are planned.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3L
Michigan soil management group: 2.5a
Primary habitat type: ATD
Secondary habitat type: AVO

128B—Goodman-Wabeno-Sundog, sandy substratum, complex, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Goodman

Surface layer:
0 to 3 inches—very dark gray silt loam

Subsurface layer:
3 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 14 inches—dark brown, friable very fine sandy loam
14 to 33 inches—brown and dark brown, friable very fine sandy loam
33 to 49 inches—dark reddish brown, friable fine sandy loam and reddish brown, friable loamy sand

Substratum:
49 to 60 inches—reddish brown fine sandy loam

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Sundog, sandy substratum

Surface layer:
0 to 3 inches—dark brown very fine sandy loam

Subsurface layer:
3 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 46 inches—dark reddish brown, dark brown, and brown, friable very fine sandy loam

Substratum:
46 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 1.0
Permeability: Goodman—moderate; Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Sundog—moderate in the upper part and rapid in the lower part
Available water capacity: Goodman—high; Wabeno—moderate; Sundog—moderate
Drainage class: Goodman—well drained; Wabeno—moderately well drained; Sundog—well drained
Seasonal high water table: Goodman—at a depth of more than 6 feet; Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Sundog—at a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Goodman soil and similar soils: 30 to 40 percent
Wabeno soil and similar soils: 25 to 30 percent
Sundog soil and similar soils: 25 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net and Channing soils in the lower landscape positions
• Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Goodman—equipment limitation; Wabeno—equipment limitation, windthrow hazard; Sundog—equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Goodman—3L; Wabeno—3L; Sundog—2L
Michigan soil management group: Goodman—2.5a; Wabeno—2a-af; Sundog—3/5a
Primary habitat type: AVO
Secondary habitat type: ATD

128D—Goodman-Wabeno-Sundog, sandy substratum, complex, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Goodman

Surface layer:
0 to 3 inches—very dark gray silt loam

Subsurface layer:
3 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 14 inches—dark brown, friable very fine sandy loam
14 to 33 inches—brown and dark brown, friable very fine sandy loam
33 to 49 inches—dark reddish brown, friable fine sandy loam and reddish brown, friable loamy sand

Substratum:
49 to 60 inches—reddish brown fine sandy loam

Wabeno

Surface layer:
0 to 2 inches—black silt loam

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 23 inches—dark brown and brown silt loam
23 to 32 inches—dark brown and brown, mottled, friable silt loam
32 to 42 inches—a fragipan of dark brown and brown, mottled, very firm very fine sandy loam
42 to 50 inches—a fragipan of reddish brown, very firm sandy loam

Substratum:
50 to 60 inches—brown sandy loam

Sundog, sandy substratum

Surface layer:
0 to 3 inches—dark brown very fine sandy loam

Subsurface layer:
3 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 46 inches—dark reddish brown, dark brown, and brown, friable very fine sandy loam

Substratum:
46 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 1.0
Permeability: Goodman—moderate; Wabeno—moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part; Sundog—moderate in the upper part and rapid in the lower part
Available water capacity: Goodman—high; Wabeno—moderate; Sundog—moderate
Drainage class: Goodman—well drained; Wabeno—moderately well drained; Sundog—well drained
Seasonal high water table: Goodman—at a depth of more than 6 feet; Wabeno—perched at a depth of 1.5 to 3.5 feet at some time from October through June; Sundog—at a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Goodman soil and similar soils: 30 to 40 percent
Wabeno soil and similar soils: 25 to 30 percent
Sundog soil and similar soils: 25 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net and Channing soils in drainageways

• Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard in areas of the Wabeno soil

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Windthrow in areas of the Wabeno soil can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Goodman—3L; Wabeno—3L; Sundog—2L
Michigan soil management group: Goodman—2.5a; Wabeno—2a-af; Sundog—3/5a
Primary habitat type: AVO
Secondary habitat type: ATD

128F—Goodman-Sundog, sandy substratum, complex, 18 to 45 percent slopes, stony

Setting

Landform and position on the landform: Hilly and steep areas on end moraines
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Typical Profile

Goodman

Surface layer:
0 to 3 inches—very dark gray silt loam

Subsurface layer:
3 to 5 inches—dark grayish brown silt loam

Subsoil:
5 to 14 inches—dark brown, friable very fine sandy loam
14 to 33 inches—brown and dark brown, friable very fine sandy loam
33 to 49 inches—dark reddish brown, friable fine sandy loam and reddish brown, friable loamy sand

Substratum:
49 to 60 inches—reddish brown fine sandy loam

Sundog, sandy substratum

Surface layer:
0 to 4 inches—dark brown very fine sandy loam

Subsurface layer:
4 to 6 inches—gray very fine sandy loam

Subsoil:
6 to 22 inches—dark reddish brown, dark brown, and brown, friable very fine sandy loam

Substratum:
22 to 60 inches—brown sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Goodman—moderate; Sundog—moderate in the upper part and rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Goodman soil and similar soils: 35 to 55 percent
Sundog soil and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Karlin soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help

to prevent excessive soil loss.
• Equipment should be used only when the soils are relatively dry or have an adequate snow cover.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Goodman—3R; Sundog—2R
Michigan soil management group: Goodman—2.5a; Sundog—3/5a
Primary habitat type: ATD
Secondary habitat type: AVO

163B—Sagola fine sandy loam, 1 to 6 percent slopes, stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 1 inch—black fine sandy loam

Subsurface layer:
1 to 7 inches—reddish gray fine sandy loam

Subsoil:
7 to 18 inches—reddish brown, friable fine sandy loam
18 to 30 inches—brown and dark brown, friable fine sandy loam
30 to 47 inches—dark reddish brown, firm fine sandy loam and reddish brown, firm loamy fine sand

Substratum:
47 to 60 inches—reddish brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Sagola soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Karlin soils, which are coarser textured than the Sagola soil; in landscape positions similar to those of the Sagola soil
• The somewhat poorly drained Solona soils in the lower landscape positions
• The poorly drained Ensley soils in depressions

Similar inclusions:
• Soils that are loamy fine sand in the upper part of the profile and fine sandy loam in the lower part
• Soils that are dominantly fine sandy loam and loam

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in

the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 4L
Michigan soil management group: 3a
Primary habitat type: TMV
Secondary habitat type: ATD

163D—Sagola fine sandy loam, 6 to 18 percent slopes, stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 1 inch—black fine sandy loam

Subsurface layer:
1 to 7 inches—reddish gray fine sandy loam

Subsoil:
7 to 18 inches—reddish brown, friable fine sandy loam
18 to 30 inches—brown and dark brown, friable fine sandy loam
30 to 47 inches—dark reddish brown, firm fine sandy loam and reddish brown, firm loamy fine sand

Substratum:
47 to 60 inches—reddish brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.10 to 0.1
Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Sagola soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Karlin soils, which are coarser textured than the Sagola soil; in landscape positions similar to those of the Sagola soil
• The somewhat poorly drained Solona soils on foot slopes and in drainageways
• The poorly drained Ensley soils in depressions

Similar inclusions:
• Soils that are loamy fine sand in the upper part of the profile and fine sandy loam in the lower part
• Soils that are dominantly fine sandy loam or loam

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4L
Michigan soil management group: 3a

Primary habitat type: TMV
Secondary habitat type: ATD

163F—Sagola fine sandy loam, 18 to 35 percent slopes, stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 1 inch—black fine sandy loam

Subsurface layer:
1 to 7 inches—reddish gray fine sandy loam

Subsoil:
7 to 18 inches—reddish brown, friable fine sandy loam
18 to 30 inches—brown and dark brown, friable fine sandy loam
30 to 47 inches—dark reddish brown, firm fine sandy loam and reddish brown, firm loamy fine sand

Substratum:
47 to 60 inches—reddish brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Sagola soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Karlin soils, which are coarser textured than the Sagola soil; in landscape positions similar to those of the Sagola soil
• The somewhat poorly drained Solona soils on foot slopes and in drainageways
• The poorly drained Ensley soils in depressions

Similar inclusions:
• Soils that are loamy fine sand in the upper part of the profile and fine sandy loam in the lower part
• Soils that are dominantly fine sandy loam or loam

Use and Management

Land use: Woodland

Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 4R
Michigan soil management group: 3a
Primary habitat type: TMV
Secondary habitat type: ATD

164B—Alstad loam, 0 to 6 percent slopes

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 4 inches—dark reddish brown loam

Subsoil:
4 to 16 inches—dark brown, mottled, friable loam
16 to 21 inches—grayish brown, mottled, firm fine sandy loam
21 to 26 inches—dark reddish brown, mottled, firm clay loam and grayish brown, mottled, firm fine sandy loam
26 to 42 inches—dark reddish brown, mottled, friable clay loam

Substratum:
42 to 60 inches—reddish brown clay loam

Soil Properties and Qualities

Depth class: Very deep

Permeability: Moderate in the upper part and moderately slow in the lower part
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 1 to 3 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Alstad soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Trenary soils on low knolls
• The somewhat poorly drained Solona soils, which are coarser textured than the Alstad soil; in landscape positions similar to those of the Alstad soil

Similar inclusions:
• Soils that have a substratum of fine sand or loamy fine sand

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Areas of the better drained included Trenary soils are more suitable as sites for landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Seasonal wetness, water erosion, tilth

Management measures:
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and the organic matter content.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 1.5b
Primary habitat type: TMC
Secondary habitat type: None assigned

165B—Sundog-Channing very fine sandy loams, 0 to 6 percent slopes

Setting

Landform and position on the landform: Sundog—nearly level and undulating areas on outwash plains and stream terraces; Channing—drainageways on outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sundog

Surface layer:
0 to 4 inches—dark brown very fine sandy loam
Subsurface layer:
4 to 6 inches—gray very fine sandy loam
Subsoil:
6 to 15 inches—dark reddish brown and dark brown, friable very fine sandy loam
15 to 22 inches—brown gravelly very fine sandy loam
Substratum:
22 to 43 inches—brown sand with bands of loamy sand
43 to 60 inches—brown very gravelly coarse sand with pockets of very fine sandy loam

Channing

Surface layer:
0 to 7 inches—dark brown very fine sandy loam
Subsurface layer:
7 to 9 inches—grayish brown, mottled very fine sandy loam
Subsoil:
9 to 24 inches—dark yellowish brown, mottled, friable very fine sandy loam
Substratum:
24 to 43 inches—strong brown and brown sand and loamy sand

43 to 60 inches—brown, stratified coarse sand and very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Sundog—moderate in the upper part and rapid or very rapid in the lower part; Channing—moderate in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Sundog—well drained; Channing—somewhat poorly drained
Seasonal high water table: Sundog—at a depth of more than 6 feet; Channing—at a depth of 0.5 foot to 1.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Sundog soil and similar soils: 40 to 60 percent
Channing soil and similar soils: 30 to 50 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Ensley soils in depressions
• Karlin and Pence soils, which are more droughty than the major soils; in landscape positions similar to those of the major soils

Similar inclusions:
• Areas where the surface of both soils is cobbly or stony
• Soils that are similar to the Sundog soil but are darker in the upper part of the subsoil

Use and Management

Land use: Dominant uses—woodland, cropland

Woodland

Major management concerns: Sundog—equipment limitation; Channing—equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment should be used only when the soils are relatively dry or have an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Sundog—soil blowing, water erosion, low organic matter content, tilth; Channing—soil blowing, low organic matter content, seasonal wetness, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and the organic matter content.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Drains can be used to reduce wetness if a suitable outlet is available.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: Sundog—2L; Channing—2W
Michigan soil management group: Sundog—3/5a; Channing—3/5b
Primary habitat type: TMV
Secondary habitat type: TMC

166F—Soperton silt loam, 18 to 35 percent slopes, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular
Size of areas: 4 to 200 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray silt loam

Subsurface layer:
1 to 5 inches—brown silt loam

Subsoil:
5 to 25 inches—dark brown and brown, friable silt loam
25 to 32 inches—a fragipan of dark brown and brown, very firm loam
32 to 41 inches—a fragipan of dark brown, very firm sandy loam

Substratum:
41 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Soperton soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Sundog and Karlin soils, which are more droughty than the Soperton soil; in landscape positions similar to those of the Soperton soil
• The well drained Stambaugh soils, which have a substratum of gravelly sand; in landscape positions similar to those of the Soperton soil

Similar inclusions:
• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion, equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: AOC

167A—Monico loam, 0 to 3 percent slopes

Setting

Landform and position on the landform: Drainageways in interdrumlin areas
Shape of areas: Long and narrow
Size of areas: 5 to 10 acres

Typical Profile

Organic mat:
0 to 2 inches—partially decomposed organic material

Surface layer:
2 to 4 inches—very dark gray loam

Subsurface layer:
4 to 7 inches—dark grayish brown, mottled loam

Subsoil:
7 to 47 inches—dark brown, mottled, friable sandy loam

Substratum:
47 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 1 to 3 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Monico soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils on low knolls

Similar inclusions:
• Soils that have a substratum of gravelly sand

Use and Management

Land use: Woodland, cropland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel.

Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Seasonal wetness, tilth

Management measures:
• Working the soil when it is too wet results in cloddiness and in compaction, which inhibits root development. As the natural soil structure is altered by compaction, surface crusting becomes more severe. Crusting can prevent seedling emergence, increase the runoff rate, and increase the hazard of erosion.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and the organic matter content.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 3b-a
Primary habitat type: ATD-CI
Secondary habitat type: None assigned

168F—Soperton-Rock outcrop complex, 18 to 35 percent slopes, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Soperton

Surface layer:
0 to 1 inch—very dark gray silt loam

Subsurface layer:
1 to 5 inches—brown silt loam

Subsoil:
5 to 25 inches—dark brown and brown, friable silt loam
25 to 32 inches—a fragipan of dark brown and brown, very firm loam
32 to 41 inches—a fragipan of dark brown, very firm sandy loam

Substratum:
41 to 60 inches—brown sandy loam

Soil Properties and Qualities

Soperton

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderate in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Soperton soil and similar soils: 70 to 80 percent
Rock outcrop: 10 to 15 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Net soils on foot slopes and in drainageways
• Sundog and Karlin soils, which are more droughty than the Soperton soil; in landscape positions similar to those of the Soperton soil
• The well drained Stambaugh soils, which have a substratum of gravelly sand; in landscape positions similar to those of the Soperton soil

Similar inclusions:
• Soils that do not have a firm layer in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion, equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.
• The areas of Rock outcrop should be considered when road locations and landing sites are planned.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: AOC

500B—Wabeno silt loam, nearly level and undulating, very stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Slope: 1 to 6 percent
Shape of areas: Long and narrow, oval, or irregular
Size of areas: 5 to 800 acres

Typical Profile

Organic mat:
0 to 1 inch—black, well decomposed organic material
Subsurface layer:
1 to 3 inches—brown silt loam
Subsoil:
3 to 19 inches—dark brown and brown, mottled, friable and firm silt loam
19 to 63 inches—a fragipan of brown and dark grayish brown, mottled, very firm and friable cobbly sandy loam and cobbly loamy sand
Substratum:
63 to 72 inches—dark grayish brown cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderately rapid in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet at some time from October through June
Surface runoff: Slow
Flooding: None

Composition

Wabeno soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Beechwood soils in the lower positions on the landscape
• Champion soils, which are coarser textured than the Wabeno soil; in landscape positions similar to those of the Wabeno soil

Similar inclusions:
• Soils that do not have mottles in the subsoil
• Soils that have a substratum of silt loam

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3L
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: None assigned

500D—Wabeno silt loam, rolling, very stony

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Slope: 6 to 18 percent
Shape of areas: Long and narrow, oval, and irregular
Size of areas: 5 to 800 acres

Typical Profile

Organic mat:
0 to 1 inch—black, well decomposed organic material
Subsurface layer:
1 to 3 inches—brown silt loam
Subsoil:
3 to 19 inches—dark brown and brown, mottled, friable and firm silt loam
19 to 63 inches—a fragipan of brown and dark grayish brown, mottled, very firm and friable cobbly sandy loam and cobbly loamy sand

Substratum:
63 to 72 inches—dark grayish brown cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderately rapid in the lower part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet at some time from October through June
Surface runoff: Medium
Flooding: None

Composition

Wabeno soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Beechwood soils on foot slopes and in drainageways
• Champion soils, which are coarser textured than the Wabeno soil; in landscape positions similar to those of the Wabeno soil

Similar inclusions:
• Soils that do not have mottles in the subsoil
• Soils that have a substratum of silt loam

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3L
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: None assigned

501F—Soperton silt loam, hilly, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Slope: 18 to 35 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray silt loam

Subsurface layer:
1 to 5 inches—brown silt loam

Subsoil:
5 to 25 inches—dark brown and brown, friable silt loam
25 to 32 inches—a fragipan of dark brown and brown, very firm loam
32 to 41 inches—a fragipan of dark brown, very firm sandy loam

Substratum:
41 to 60 inches—brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, moderately slow in the fragipan, and moderately rapid in the lower part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Soperton soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Beechwood soils on foot slopes and in drainageways
• Champion soils, which are coarser textured than the Soperton soil; in landscape positions similar to those of the Soperton soil

Similar inclusions:
• Soils that have mottles in the subsoil
• Soils that have a substratum of silt loam

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard,

equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2a-af
Primary habitat type: AVO
Secondary habitat type: None assigned

502B—Champion very fine sandy loam, moderately wet, nearly level and undulating, very stony

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—gray very fine sandy loam

Subsoil:
4 to 11 inches—dark brown and dark reddish brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam

Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in the next part, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Champion soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower positions on the landscape

Similar inclusions:
• Areas of well drained soils that contain a higher percentage of silt in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3W
Michigan soil management group: 2a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

502D—Champion very fine sandy loam, moderately wet, rolling, very stony

Setting

Landform and position on the landform: Rolling areas on ground moraines
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—gray very fine sandy loam
Subsoil:
4 to 11 inches—dark brown and dark reddish brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, mottled, extremely firm gravelly fine sandy loam
Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3 percent
Permeability: Moderate in the upper part, very slow in the next part, and moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Medium
Flooding: None

Composition

Champion soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions
Similar inclusions:
• Areas of well drained soils that contain a higher percentage of silt in the subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation, windthrow hazard
Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3W
Michigan soil management group: 2a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

502F—Champion very fine sandy loam, hilly, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Slope: 18 to 35 percent
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 100 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—gray very fine sandy loam
Subsoil:
4 to 11 inches—dark brown and dark reddish brown, very friable and friable very fine sandy loam
11 to 20 inches—dark brown and brown, friable very fine sandy loam
20 to 49 inches—a fragipan of dark grayish brown and dark brown, extremely firm gravelly fine sandy loam
Substratum:
49 to 60 inches—grayish brown gravelly fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kinds—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part, very slow in

the next part, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Champion soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Areas of the somewhat poorly drained, coarse-loamy Typic Fragiaquods on foot slopes and in drainageways

Similar inclusions:
• Areas of well drained soils that have a higher percentage of silt in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation, windthrow hazard

Management measures:
• Erosion results from the concentration of runoff on logging roads, in the tracks of wheeled equipment, and on landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of stones and boulders on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 2a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

503A—Typic Fragiaquods, coarse-loamy, nearly level

Setting

Landform and position on the landform: Drainageways on ground moraines
Slope: 0 to 3 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 30 acres

Reference Profile

Organic mat:
0 to 2 inches—black, well decomposed organic material
Surface layer:
2 to 7 inches—black loam
Subsurface layer:
7 to 9 inches—dark gray, mottled loam
Subsoil:
9 to 15 inches—brown, mottled, friable sandy loam
15 to 38 inches—a fragipan of grayish brown and reddish brown, mottled, firm and very firm sandy loam
Substratum:
38 to 60 inches—grayish brown, mottled cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through June
Surface runoff: Slow
Flooding: None

Composition

Typic Fragiaquods, coarse-loamy, and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Champion soils in the slightly higher positions on the landscape
• The poorly drained, nonacid, very stony Humaquepts in depressions

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitation,

seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Small areas of the better drained included soils are more suitable as landing areas.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W
Michigan soil management group: None assigned
Primary habitat type: TMC
Secondary habitat type: None assigned

504B—Pence fine sandy loam, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and stream terraces
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter
Surface layer:
1 to 2 inches—dark brown fine sandy loam
Subsurface layer:
2 to 5 inches—pinkish gray fine sandy loam
Subsoil:
5 to 20 inches—dark brown, friable and very friable fine sandy loam and sandy loam
20 to 35 inches—strong brown, loose gravelly sand
Substratum:
35 to 60 inches—dark yellowish brown very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Pence soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Monico soils that have a seasonal high water table; in the slightly lower landscape positions
Similar inclusions:
• Soils that have a finer textured subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture

content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: None assigned

504D—Pence fine sandy loam, rolling

Setting

Landform and position on the landform: Rolling areas on stream terraces and outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Typical Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter

Surface layer:
1 to 2 inches—dark brown fine sandy loam

Subsurface layer:
2 to 5 inches—pinkish gray fine sandy loam

Subsoil:
5 to 20 inches—dark brown, friable and very friable fine sandy loam and sandy loam
20 to 35 inches—strong brown, loose gravelly sand

Substratum:
35 to 60 inches—dark yellowish brown very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Pence soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• Small areas of the somewhat poorly drained Monico soils that have a seasonal high water table; in the slightly lower positions on foot slopes and in drainageways

Similar inclusions:
• Soils that have a finer textured subsoil

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: None assigned

504F—Pence fine sandy loam, hilly

Setting

Landform and position on the landform: Hilly areas on stream terraces and outwash plains
Slope: 18 to 35 percent
Shape of areas: Irregular or long and narrow
Size of areas: 3 to 100 acres

Typical Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter
Surface layer:
1 to 2 inches—dark brown fine sandy loam
Subsurface layer:
2 to 5 inches—pinkish gray fine sandy loam
Subsoil:
5 to 20 inches—dark brown, friable and very friable fine sandy loam and sandy loam
20 to 35 inches—strong brown, loose gravelly sand
Substratum:
35 to 60 inches—dark yellowish brown very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Pence soil and similar soils: 100 percent

Inclusions

Similar inclusions:
• Soils that are finer textured in the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of the slope, the number of suitable landing sites is minimal. The best sites are small, nearly level areas, if any are available, and the nearly level adjacent areas.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: None assigned

505—Humaquepts, acid, very stony

Setting

Landform and position on the landform: Depressions on outwash plains, moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Soil Properties and Qualities

Texture: 0 to 16 inches of partially decomposed or well decomposed organic material over loamy or sandy material
Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Variable
Available water capacity: Variable
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: None

Composition

Humaquepts and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly higher landscape positions

Similar inclusions:
• Soils that are more than 16 inches deep over mineral material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Because of stones on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Because of wetness, severe seedling mortality, and plant competition, trees generally are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TTS
Secondary habitat type: None assigned

506—Humaquepts, nonacid, very stony

Setting

Landform and position on the landform: Depressions on outwash plains and moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 15 acres

Soil Properties and Qualities

Texture: 0 to 16 inches of partially decomposed or well decomposed organic material over loamy or sandy material
Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Variable
Available water capacity: Variable
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: None

Composition

Humaquepts and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods and Monico soils in the slightly higher landscape positions

Similar inclusions:
• Soils that are more than 16 inches deep over mineral material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Because of stones and boulders on the surface, wheeled skidders with high clearance should be operated at a reduced speed over carefully chosen routes.
• Because of wetness, severe seedling mortality, and plant competition, trees generally are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: FMC
Secondary habitat type: FI

507A—Monico loam, nearly level

Setting

Landform and position on the landform: Drainageways in interdrumlin areas
Slope: 0 to 3 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 20 acres

Typical Profile

Organic mat:
0 to 2 inches—partially decomposed organic material

Surface layer:
2 to 4 inches—very dark gray loam

Subsurface layer:
4 to 7 inches—dark grayish brown, mottled loam
Subsoil:
7 to 47 inches—dark brown, mottled, friable sandy loam
Substratum:
47 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 1 to 3 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Monico and similar soils: 80 to 85 percent
Contrasting inclusions: 15 to 20 percent

Inclusions

Contrasting inclusions:
• Small areas of the moderately well drained Champion and Wabeno soils in the higher landscape positions
• Small areas of the poorly drained, nonacid, very stony Humaquepts in depressions

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Seasonal wetness, tilth

Management measures:
• Working the soil when it is too wet results in cloddiness and in compaction, which inhibits root development. As the natural soil structure is altered by compaction, surface crusting becomes more severe. Crusting can prevent seedling emergence, increase the runoff rate, and increase the susceptibility to erosion.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and the organic matter content.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 3b-a
Primary habitat type: ATD-CI
Secondary habitat type: None assigned

508A—Beechwood silt loam, nearly level

Setting

Landform and position on the landform: Drainageways on drumlinoid ground moraines
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 100 acres

Typical Profile

Organic mat:
0 to 2 inches—dark yellowish brown, well decomposed organic material
Subsurface layer:
2 to 4 inches—grayish brown silt loam
Subsoil:
4 to 34 inches—brown and yellowish brown, mottled, friable silt loam
34 to 49 inches—dark yellowish brown, mottled, friable sandy loam
Substratum:
49 to 71 inches—reddish yellow, mottled loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface at some time from September through July
Surface runoff: Slow
Flooding: None

Composition

Beechwood soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Wabeno soils in the higher landscape positions

• The poorly drained, nonacid, very stony Humaquepts and the very poorly drained, nonacid Borosaprists; in depressions

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:

• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness, tilth

Management measures:

• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W
Michigan soil management group: 3b
Primary habitat type: TMC
Secondary habitat type: None assigned

509A—Typic Dystrochrepts, coarse-loamy, deep water table, nearly level

Setting

Landform and position on the landform: Nearly level areas on ground moraines
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 30 acres

Reference Profile

Organic mat:
0 to 1 inch—recent hardwood litter
1 to 3 inches—black, decomposed organic material

Surface layer:
3 to 5 inches—dark brown silt loam

Subsoil:
5 to 12 inches—dark yellowish brown, friable cobbly silt loam
12 to 51 inches—dark yellowish brown and dark brown, mottled, firm cobbly silt loam
51 to 63 inches—dark yellowish brown, mottled, firm silt loam

Substratum:
63 to 72 inches—dark brown, mottled silt loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 4 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Typic Dystrochrepts and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:

• The somewhat poorly drained Monico soils in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Using wheeled and tracked equipment when the soils are wet results in ruts and surface compaction and can damage tree roots.

Interpretive Groups

Land capability classification: IIs
Woodland ordination symbol: 3L
Michigan soil management group: None assigned
Primary habitat type: AVO-CI
Secondary habitat type: None assigned

510—Borosaprists, nonacid

Setting

Landform and position on the landform: Depressions on outwash plains and moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: 16 to more than 51 inches of well decomposed organic material over loamy or sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Borosaprists and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, nonacid, very stony Humaquepts in landscape positions similar to those of the Borosaprists
• The poorly drained Humaquepts that have a sandy substratum; in landscape positions similar to those of the Borosaprists
• The somewhat poorly drained, nearly level Haplaquods in the slightly higher landscape positions

Similar inclusions:
• Organic soils that are more acid

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seeding mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TTS
Secondary habitat type: None assigned

511B—Typic Dystrochrepts, coarse-loamy, sandy substratum, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains, stream terraces, and alluvial fans
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Reference Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter

Surface layer:
1 to 3 inches—very dark gray fine sandy loam

Subsurface layer:
3 to 7 inches—brown fine sandy loam

Subsoil:
7 to 41 inches—brown, friable fine sandy loam

Substratum:
41 to 60 inches—dark brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Moderate

Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Typic Dystrochrepts and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions
Similar inclusions:
• Soils that are less than 40 inches deep over sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation
Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 9L
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

511D—Typic Dystrochrepts, coarse-loamy, sandy substratum, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains, stream terraces, and alluvial fans
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Reference Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter
Surface layer:
1 to 3 inches—very dark gray fine sandy loam
Subsurface layer:
3 to 7 inches—brown fine sandy loam
Subsoil:
7 to 41 inches—brown, friable fine sandy loam
Substratum:
41 to 60 inches—dark brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Typic Dystrochrepts and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions
Similar inclusions:
• Soils that are less than 40 inches deep over sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation
Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 9L
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

511F—Typic Dystrochrepts, coarse-loamy, sandy substratum, hilly

Setting

Landform and position on the landform: Hilly areas on outwash plains, stream terraces, and alluvial fans
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Reference Profile

Organic mat:
0 to 1 inch—partially decomposed forest litter

Surface layer:
1 to 3 inches—very dark gray fine sandy loam
Subsurface layer:
3 to 7 inches—brown fine sandy loam
Subsoil:
7 to 41 inches—brown, friable fine sandy loam
Substratum:
41 to 60 inches—dark brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Typic Dystrochrepts and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods on foot slopes and in drainageways
Similar inclusions:
• Soils that are less than 40 inches deep over sand

Use and Management

Land use: Woodland
Major management concerns: Erosion hazard, equipment limitation
Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of the slope, the number of suitable landing sites is minimal. The best sites are small, nearly level areas, if any are available, and the nearly level adjacent areas.
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 9R
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

512—Borosaprists, acid

Setting

Landform and position on the landform: Depressions on outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: 16 to more than 51 inches of well decomposed organic material over loamy or sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Borosaprists and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, acid, very stony Humaquepts in landscape positions similar to those of the Borosaprists
• The somewhat poorly drained, nearly level Haplaquods in the slightly higher landscape positions
Similar inclusions:
• Organic soils that are less acid

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation, seeding mortality, windthrow hazard
Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees generally are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: PCS
Secondary habitat type: None assigned

513B—Entic Haplorthods, coarse-loamy, deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on deltas, alluvial fans, and stream terraces
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Reference Profile

Organic mat:
0 to 1 inch—black, partially decomposed hardwood and conifer litter
Surface layer:
1 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 8 inches—reddish gray fine sandy loam
Subsoil:
8 to 30 inches—dark reddish brown and reddish brown, friable and very friable fine sandy loam
30 to 47 inches—yellowish red, loose sand
Substratum:
47 to 60 inches—reddish brown, mottled sand with thin bands of sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper loamy part and rapid in the lower sandy part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: 4 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions
Similar inclusions:
• Soils that are darker in the upper part of the subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation
Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

514B—Stambaugh silt loam, moderately wet, nearly level and undulating, stony

Setting

Landform and position on the landform: Undulating areas on stream terraces
Slope: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Organic mat:
0 to 2 inches—partially decomposed forest litter
Surface layer:
2 to 8 inches—dark brown silt loam
Subsoil:
8 to 23 inches—brown, friable silt loam
23 to 44 inches—brown and dark brown, mottled, firm sandy loam and silt loam
Substratum:
44 to 60 inches—yellowish brown, mottled very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Moderately slow in the upper part and rapid in the sandy part
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: 2.5 to 6.0 feet below the surface at some time from November through April

Surface runoff: Slow
Flooding: None

Composition

Stambaugh and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Beechwood soils in the slightly lower landscape positions

Similar inclusions:
• Soils that are less than 40 inches deep over the gravelly substratum

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Stones on the surface may interfere with the use of tillage and planting equipment and some harvesting equipment. Removing the stones minimizes wear on equipment.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3L
Michigan soil management group: 3/5a
Primary habitat type: ATD
Secondary habitat type: None assigned

515—Borosaprists, frequently flooded

Setting

Landform and position on the landform: First bottom on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 300 acres

Soil Properties and Qualities

Texture: 16 to more than 51 inches of well decomposed organic material over loamy or sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: Near the surface to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: Frequent

Composition

Borosaprists and similar soils: 100 percent

Inclusions

Similar inclusions:
• Soils that have thin layers of mineral material in the profile
• Soils underlain by mineral material at a depth of less than 16 inches

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seeding mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, occasional flooding, and severe seedling mortality, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned

Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: FMC
Secondary habitat type: None assigned

516B—Fragiorthods, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and end moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Texture: 15 to 20 inches of loam over 10 to 15 inches of firm fine sandy loam and very fine sandy loam; underlain by loamy sand to gravelly sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from October through May
Surface runoff: Slow
Flooding: None

Composition

Fragiorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment should be used only during periods when the soils are relatively dry or have an adequate snow cover.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned

Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMV
Secondary habitat type: None assigned

516D—Fragiorthods, rolling

Setting

Landform and position on the landform: Rolling areas on ground moraines and end moraines
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Depth class: Very deep
Texture: 15 to 20 inches of loam over 10 to 15 inches of firm fine sandy loam and very fine sandy loam; underlain by loamy sand to gravelly sand
Permeability: Variable
Available water capacity: Variable
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from October through May
Surface runoff: Medium
Flooding: None

Composition

Fragiorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, coarse-loamy Typic Fragiaquods in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment should be used only when the soils are relatively dry or have an adequate snow cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned

Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMV
Secondary habitat type: None assigned

517B—Lode silt loam, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and stream terraces
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 800 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown silt loam
Subsoil:
7 to 31 inches—dark brown and reddish brown, friable and firm loam and sandy loam
31 to 37 inches—strong brown, loose coarse sand
Substratum:
37 to 70 inches—brown and dark yellowish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Lode soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Pence soils, which are more droughty than the Lode soil; in landscape positions similar to those of the Lode soil
• The somewhat poorly drained Monico soils that have a seasonal high water table; in the slightly lower landscape positions

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
• Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 7L
Michigan soil management group: 3/5a-a
Primary habitat type: TM
Secondary habitat type: None assigned

517D—Lode silt loam, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains and stream terraces
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown silt loam
Subsoil:
7 to 31 inches—dark brown and reddish brown, friable and firm loam and sandy loam
31 to 37 inches—strong brown, loose coarse sand
Substratum:
37 to 70 inches—brown and dark yellowish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Lode soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Pence soils, which are more droughty than the Lode soil; in landscape positions similar to those of the Lode soil
• The somewhat poorly drained Monico soils that have a seasonal high water table; in the slightly lower landscape positions

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation

Management measures:
• The use of equipment is briefly restricted in spring and during other excessively wet periods. Access is easiest during periods in winter when access roads are frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness, tilth

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
• Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 7L
Michigan soil management group: 3/5a-a
Primary habitat type: TM
Secondary habitat type: None assigned

517F—Lode silt loam, hilly

Setting

Landform and position on the landform: Hilly areas on outwash plains and stream terraces
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown silt loam
Subsoil:
7 to 31 inches—dark brown and reddish brown, friable and firm loam and sandy loam
31 to 37 inches—strong brown, loose coarse sand
Substratum:
37 to 70 inches—brown and dark yellowish brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very rapid in the lower part

Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Lode soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Pence soils, which are more droughty than the Lode soil; in landscape positions similar to those of the Lode soil
• The somewhat poorly drained Monico soils that have a seasonal high water table; on foot slopes and in drainageways
• Areas that have slopes of 35 to 45 percent

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 7R
Michigan soil management group: 3/5a-a
Primary habitat type: TM
Secondary habitat type: None assigned

518—Humaquepts, sandy substratum

Setting

Landform and position on the landform: Depressions on outwash plains and moraines
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: 0 to 16 inches of partially decomposed or well decomposed organic material over 25 to 35 inches of loamy material; underlain by sand and gravel
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: None

Composition

Humaquepts and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Monico soils that have a sandy substratum; in the slightly higher landscape positions

Similar inclusions:
• Soils that are more than 16 inches deep over mineral material
• Soils that are less than 40 inches deep over sandy material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Because of wetness, severe seedling mortality, and plant competition, trees generally are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TTS
Secondary habitat type: None assigned

519A—Monico loam, sandy substratum, nearly level

Setting

Landform and position on the landform: Drainageways on outwash plains and stream terraces
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 200 acres

Typical Profile

Organic mat:
0 to 1 inch—black, decomposed forest litter
Surface layer:
1 to 7 inches—very dark gray loam
Subsurface layer:
7 to 19 inches—brown sandy loam
Subsoil:
19 to 46 inches—brown, mottled, friable fine sandy loam
Substratum:
46 to 60 inches—dark brown, mottled loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Monico soil and similar soils: 80 to 85 percent
Contrasting inclusions: 15 to 20 percent

Inclusions

Contrasting inclusions:
• Small areas of the poorly drained Humaquepts that have a sandy substratum; in depressions
• Small areas of the very poorly drained, frequently flooded Fluvaquents in drainageways

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Landing sites are generally available only during the driest time of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Cropland

Major management concerns: Seasonal wetness, tilth

Management measures:
• Working the soil when it is too wet results in cloddiness and in compaction, which inhibits root development. As the natural soil structure is altered by compaction, surface crusting becomes more severe. Crusting can prevent seedling emergence, increase the runoff rate, and increase the susceptibility to erosion.
• Tile drains can be used to reduce wetness if a suitable outlet is available.
• Crop residue management, cover crops, green manure crops, proper use of manure, and conservation tillage help to maintain and improve tilth, the moisture-holding capacity, and the organic matter content.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 5W
Michigan soil management group: 3b-a
Primary habitat type: TMC-Vac
Secondary habitat type: None assigned

520B—Haplorthods, deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Soil Properties and Qualities

Texture: Loamy and sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Moderately well drained
Seasonal high water table: 4 to 6 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Haplorthods and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Pence and Lode soils in the slightly higher landscape positions
- The somewhat poorly drained Monico soils in the slightly lower landscape positions
- The very poorly drained, nonacid Borosaprists in depressions

Use and Management

Land use: Woodland
- Onsite investigation is needed to determine specific management concerns or to determine the suitability for other uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMC-Vac
Secondary habitat type: None assigned

521B—Pence sandy loam, very deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and stream terraces
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 2 inches—very dark gray sandy loam
Subsurface layer:
2 to 4 inches—brown sandy loam
Subsoil:
4 to 12 inches—dark brown, friable sandy loam
12 to 22 inches—dark brown, friable gravelly loamy sand
22 to 51 inches—brown and dark yellowish brown, mottled, friable loamy sand, sand, and coarse sand
Substratum:
51 to 60 inches—dark brown very gravelly sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: 6 to 10 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Pence soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Lode soils, which are finer textured than the Pence soil; in landscape positions similar to those of the Pence soil

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness, tilth

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
- Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.
- Minimizing tillage and tilling at the proper soil moisture content help to maintain good tilth and prevent crusting.

Interpretive Groups

Land capability classification: IIIe

Woodland ordination symbol: 9A
Michigan soil management group: 4a-a
Primary habitat type: TMV
Secondary habitat type: None assigned

522D—Entic Fragiorthods, coarse-loamy-Typic Dystrochrepts complex, nearly level to hilly, rocky, stony

Setting

Landform and position on the landform: Nearly level to hilly areas on ground moraines
Slope: 1 to 25 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Reference Profile

Entic Fragiorthods
Organic mat:
0 to 2 inches—partially decomposed hardwood and conifer litter
Surface layer:
2 to 7 inches—very dark gray loam
Subsurface layer:
7 to 8 inches—brown loam
Subsoil:
8 to 16 inches—dark brown, mottled, friable loam
16 to 26 inches—a fragipan of brown and dark brown, mottled, very firm fine sandy loam
26 to 45 inches—dark brown, mottled, friable sandy loam
Substratum:
45 to 60 inches—dark grayish brown, mottled gravelly sandy loam

Typic Dystrochrepts
Texture: 10 to 24 inches of sandy loam to very cobbly loam over very gravelly or very cobbly sandy material

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—0.01 to 0.1
Permeability: Entic Fragiorthods—moderate in the upper part, very slow in the fragipan, and moderate in the substratum; Typic Dystrochrepts—variable
Available water capacity: Entic Fragiorthods—low; Typic Dystrochrepts—variable
Drainage class: Entic Fragiorthods—moderately well drained; Typic Dystrochrepts—well drained
Seasonal high water table: Entic Fragiorthods—perched at a depth of 1 to 2 feet at some time from November through May; Typic Dystrochrepts—at a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Entic Fragiorthods and similar soils: 55 to 65 percent
Typic Dystrochrepts and similar soils: 20 to 25 percent
Rock outcrop: 5 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods on foot slopes and in drainageways
• The poorly drained, nonacid, very stony Humaquepts in depressions

Similar inclusions:
• Soils that are less than 40 inches deep over bedrock

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: Entic Fragiorthods—8W; Typic Dystrochrepts—none assigned
Michigan soil management group: None assigned
Primary habitat type: Entic Fragiorthods—ATD; Typic Dystrochrepts—TMV
Secondary habitat type: None assigned

523B—Entic Haplorthods-Typic Haplaquepts complex, nearly level and undulating

Setting

Landform and position on the landform: Entic Haplorthods—nearly level and undulating areas on outwash plains and moraines; Typic Haplaquepts—

depressions or swales on outwash plains and moraines
Slope: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Texture: Loamy or sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Entic Haplorthods—well drained; Typic Haplaquepts—poorly drained
Seasonal high water table: Entic Haplorthods—perched at a depth of 6 to 10 feet at some time from November through March; Typic Haplaquepts—1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Entic Haplorthods—slow; Typic Haplaquents—very slow or ponded
Flooding: None

Composition

Entic Haplorthods and similar soils: 60 to 70 percent
Typic Haplaquents and similar soils: 25 to 25 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils and the moderately well drained, coarse-loamy Alfic Fragiorthods that have a dense subsoil; in landscape positions similar to those of the Entic Haplorthods
• The very poorly drained, nonacid Borosaprists in closed depressions; in landscape positions similar to those of the Typic Haplaquents

Similar inclusions:
• Soils that are similar to the Entic Haplorthods but have a water table at a depth of 4 to 6 feet
• Soils that are similar to the Entic Haplorthods but are darker in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• The seasonal high water table in areas of the Typic Haplaquepts restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen or have an adequate snow cover.
• Windthrow in areas of the Typic Haplaquents can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.
• Onsite investigation is needed to determine the suitability for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: Entic Haplorthods—ATD; Typic Haplaquepts—TMC
Secondary habitat type: None assigned

524D—Haplorthods, bedrock substratum, rolling, rocky

Setting

Landform and position on the landform: Rolling areas on ground moraines
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Texture: Loamy, sandy, or gravelly material 40 to 90 inches thick; underlain by bedrock
Depth class: Deep or very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Haplorthods and similar soils: 95 to 98 percent
Rock outcrop: 2 to 5 percent

Inclusions

Similar inclusions:
• Soils that are less than 40 inches deep over bedrock

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the content of gravel on the surface in some areas, machine planting is difficult.
• Rock outcrops should be considered when road locations and landing sites are planned.
• Onsite investigation is needed to determine the suitability for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

524F—Haplorthods, bedrock substratum, hilly to very steep, rocky

Setting

Landform and position on the landform: Hilly to very steep areas on ground moraines and end moraines
Slope: 18 to 60 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Soil Properties and Qualities

Texture: Loamy, sandy, or gravelly material 40 to 90 inches thick; underlain by bedrock
Depth class: Deep or very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Haplorthods and similar soils: 95 to 98 percent
Rock outcrop: 2 to 5 percent

Inclusions

Similar inclusions:
• Soils that are less than 40 inches deep over bedrock

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
• Because of the slope, ordinary crawler tractors and rubber-tired skidders cannot be operated safely in areas of these soils. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Rock outcrops should be considered when road locations and landing sites are planned.
• Onsite investigation is needed to determine the suitability for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

525B—Entic Haplorthods, sandy-skeletal, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on end moraines and eskers
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Reference Profile

Organic mat:
0 to 2 inches—partially decomposed conifer and hardwood litter
Subsurface layer:
2 to 5 inches—brown cobbly sandy loam
Subsoil:
5 to 18 inches—dark brown, friable gravelly sandy loam
18 to 52 inches—dark yellowish brown, loose extremely cobbly coarse sand
Substratum:
52 to 65 inches—very dark grayish brown extremely cobbly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the lower landscape positions
• The moderately well drained Gogebic soils, which have a root-limiting subsoil; in landscape positions

similar to those of the Entic Haplorthods

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Because of the content of cobbles, machine planting may be difficult.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3F
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

525D—Entic Haplorthods, sandy-skeletal, rolling and hilly

Setting

Landform and position on the landform: Rolling and hilly areas on end moraines and eskers
Slope: 6 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Reference Profile

Organic mat:
0 to 2 inches—partially decomposed conifer and hardwood litter

Subsurface layer:
2 to 5 inches—brown cobbly sandy loam

Subsoil:
5 to 18 inches—dark brown, friable gravelly sandy loam
18 to 52 inches—dark yellowish brown, loose extremely cobbly coarse sand

Substratum:
52 to 65 inches—very dark grayish brown extremely cobbly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils, which have a root-limiting subsoil; in landscape positions similar to those of the Entic Haplorthods

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the content of cobbles, machine planting may be difficult.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3R
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

525F—Entic Haplorthods, sandy-skeletal, steep and very steep

Setting

Landform and position on the landform: Steep and very steep areas on end moraines and eskers
Slope: 35 to 55 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Organic mat:
0 to 2 inches—partially decomposed conifer and hardwood litter
Subsurface layer:
2 to 5 inches—brown cobbly sandy loam
Subsoil:
5 to 18 inches—dark brown, friable gravelly sandy loam
18 to 52 inches—dark yellowish brown, loose extremely cobbly coarse sand
Substratum:
52 to 65 inches—very dark grayish brown extremely cobbly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the loamy part and rapid in the sandy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils, which have a root-limiting subsoil; in the slightly lower landscape positions

Use and Management

Land use: Woodland
Major management concerns: Erosion hazard, equipment limitation, windthrow hazard
Management measures:
• Because of the erosion hazard, water should be removed by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Because of the slope, ordinary crawler tractors and rubber-tired skidders cannot be operated safely in areas of these soils. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the content of cobbles, machine planting may be difficult.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3R
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

527—Borohemists-Borosaprists, acid, complex

Setting

Landform: Depressions on outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: Borohemists—decomposed and partially decomposed organic material; Borosaprists—decomposed organic material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Borohemists and similar soils: 40 to 50 percent
Borosaprists and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, nonacid, very stony, mineral Humaquepts in landscape positions similar to those of the major soils
• The somewhat poorly drained, nearly level Haplaquods in the slightly higher landscape positions

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation, seedling mortality, windthrow hazard
Management measures:
• Because of wetness and low strength, special

harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: PCS
Secondary habitat type: None assigned

528—Borohemists, acid

Setting

Landform and position on the landform: Depressions on outwash plains
Slope: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: Decomposed and partially decomposed organic material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Borohemists and similar soils: 100 percent

Inclusions

Similar inclusions:
• Organic soils composed only of well decomposed material

Use and Management

Land use: Woodland, open bogs

Major management concerns: Equipment limitation, seeding mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: PCS
Secondary habitat type: None assigned

529—Borohemists, nonacid

Setting

Landform and position on the landform: Depressions on outwash plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: Decomposed and partially decomposed organic material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Composition

Borohemists and similar soils: 100 percent

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seeding mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by

selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TTS
Secondary habitat type: None assigned

530—Borosaprists-Histic Humaquepts, nonacid, complex

Setting

Landform and position on the landform: Levees on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 20 acres

Soil Properties and Qualities

Texture: Borosaprists—decomposed organic material; Histic Humaquepts—less than 16 inches of decomposed organic material over loamy or sandy deposits
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above the surface to 1 foot below the surface at some time from September through June
Surface runoff: Ponded
Flooding: Occasional

Composition

Borosaprists and similar soils: 45 to 55 percent
Histic Humaquepts and similar soils: 35 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Areas of the somewhat poorly drained Haplaquods in the slightly higher landscape positions

Similar inclusions:
• Very poorly drained soils that have a mineral surface layer

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TTS
Secondary habitat type: None assigned

531C—Champion silt loam, nearly level to rolling, very stony

Setting

Landform and position on the landform: Nearly level to rolling areas on ground moraines and end moraines
Slope: 1 to 12 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Organic mat:
0 to 2 inches—black, decomposed organic material

Subsurface layer:
2 to 4 inches—brown silt loam

Subsoil:
4 to 12 inches—dark reddish brown, friable silt loam
12 to 29 inches—reddish brown and brown, friable cobbly fine sandy loam
29 to 37 inches—a fragipan of dark grayish brown, very firm cobbly loamy sand
37 to 60 inches—a fragipan of dark grayish brown, mottled, very firm cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Moderate in the upper part and very slow in the fragipan
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Medium
Flooding: None

Composition

Champion soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The poorly drained, nonacid, very stony Histic Humaquepts in small depressions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

532F—Champion-Haplorthods complex, hilly, rocky, very stony

Setting

Landform and position on the landform: Hilly areas on end moraines
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Champion
Organic mat:
0 to 2 inches—black, decomposed organic material
Subsurface layer:
2 to 4 inches—brown silt loam
Subsoil:
4 to 12 inches—dark reddish brown, friable silt loam
12 to 29 inches—reddish brown and brown, friable cobbly fine sandy loam
29 to 37 inches—a fragipan of dark grayish brown, very firm cobbly loamy sand
37 to 60 inches—a fragipan of dark grayish brown, mottled, very firm cobbly sandy loam

Haplorthods, bedrock substratum
Texture: 20 to 60 inches of sandy loam to extremely cobbly silt loam over bedrock

Soil Properties and Qualities

Depth class: Champion—very deep; Haplorthods—moderately deep and deep
Rock fragments on the surface: Kind—stones and cobbles; percentage of surface covered—1 to 3
Permeability: Champion—moderate in the upper part and very slow in the fragipan; Haplorthods—variable
Available water capacity: Champion—low; Haplorthods—variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Champion soil and similar soils: 55 to 60 percent
Haplorthods and similar soils: 35 to 40 percent
Rock outcrop: 5 percent

Inclusions

Similar inclusions:
• Soils that are less than 20 inches deep over bedrock

Use and Management

Land use: Woodland

Major management concerns: Erosion, equipment limitation, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Rock outcrops and the shallow depth to bedrock in some areas should be considered when road locations and landing sites are planned.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Champion—3R;

Haplorthods—none assigned
Michigan soil management group: Champion—3a-af; Haplorthods—none assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

533B—Entic Fragiorthods, coarse-loamy, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Reference Profile

Organic mat:
0 to 2 inches—dark reddish brown, partially decomposed forest litter

Surface layer:
2 to 4 inches—very dark gray very fine sandy loam

Subsurface layer:
4 to 8 inches—reddish gray very fine sandy loam

Subsoil:
8 to 21 inches—dark reddish brown and dark brown, friable very fine sandy loam
21 to 35 inches—a fragipan of dark grayish brown and dark brown, very firm gravelly loamy sand and gravelly sandy loam

Substratum:
35 to 60 inches—grayish brown, mottled gravelly loamy sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the substratum
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Entic Fragiorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Areas of the very poorly drained, nonacid Borosaprists in closed depressions

Similar inclusions:
• Soils in which the upper part of the subsoil is darker and thicker

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 8W
Michigan soil management group: None assigned
Primary habitat type: TMC-D
Secondary habitat type: None assigned

534B—Entic Haplorthods, sandy, stratified substratum, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 1,500 acres

Reference Profile

Surface layer:
0 to 1 inch—black sandy loam

Subsurface layer:
1 to 2 inches—reddish gray loamy sand

Subsoil:
2 to 6 inches—reddish brown, friable loamy sand
6 to 19 inches—yellowish red, loose gravelly coarse sand
19 to 41 inches—light brown, loose sand

Substratum:
41 to 60 inches—light brown sand that has strata of fine sand, loamy sand, and gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep

Permeability: Moderately rapid in the upper part and moderately rapid or rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The very poorly drained, nonacid Borohemists in depressions

Use and Management

Land use: Woodland

Major management concerns: None

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6A
Michigan soil management group: None assigned
Primary habitat type: AQV
Secondary habitat type: None assigned

534D—Entic Haplorthods, sandy, stratified substratum, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Reference Profile

Surface layer:
0 to 1 inch—black sandy loam

Subsurface layer:
1 to 2 inches—reddish gray loamy sand

Subsoil:
2 to 6 inches—reddish brown, friable loamy sand
6 to 19 inches—yellowish red, loose gravelly coarse sand
19 to 41 inches—light brown, loose sand

Substratum:
41 to 60 inches—light brown sand that has strata of fine sand, loamy sand, and gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part and moderately rapid or rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The very poorly drained, nonacid Borohemists in depressions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on landings
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6A
Michigan soil management group: None assigned
Primary habitat type: AQV
Secondary habitat type: None assigned

535B—Vilas loamy sand, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 2 inches—brown loamy sand

Subsoil:
2 to 30 inches—dark reddish brown, very friable loamy sand
30 to 42 inches—brown, loose sand

Substratum:
42 to 95 inches—light brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Vilas soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the slightly lower landscape positions
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: None

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6A
Michigan soil management group: 5.3a
Primary habitat type: AQV
Secondary habitat type: None assigned

535D—Vilas loamy sand, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 2 inches—brown loamy sand

Subsoil:
2 to 30 inches—dark reddish brown, very friable loamy sand
30 to 42 inches—brown, loose sand

Substratum:
42 to 95 inches—light brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Vilas soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in drainageways
• The moderately well drained Entic Haplorthods that have a moderately deep water table; on foot slopes and in drainageways

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 6A
Michigan soil management group: 5.3a
Primary habitat type: AQV
Secondary habitat type: None assigned

536F—Entic Haplorthods, sandy-skeletal, esker, very steep

Setting

Landform and position on the landform: Steep and very steep areas on eskers
Slope: 35 to 55 percent
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres

Reference Profile

Organic mat:
0 to 4 inches—partially decomposed forest litter

Surface layer:
4 to 6 inches—dark brown silt loam

Subsurface layer:
6 to 8 inches—brown silt loam

Subsoil:
8 to 18 inches—dark brown, friable gravelly sandy loam
18 to 29 inches—dark yellowish brown, loose very gravelly coarse sand

Substratum:
29 to 60 inches—dark yellowish brown extremely gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper loamy part and rapid in the lower sandy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Entic Haplorthods and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3R
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

537B—Haplorthods, moderately deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and deltas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Soil Properties and Qualities

Texture: Loamy sand to gravelly coarse sand throughout
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Moderately well drained
Seasonal high water table: 2 to 3 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the slightly lower landscape positions
• The excessively drained Vilas soils in the slightly higher landscape positions

Similar inclusions:
• Soils that are sandy loam in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Windthrow hazard

Management measures:
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

Primary habitat type: TMV
Secondary habitat type: None assigned

538B—Entic Haplorthods, sandy substratum, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Soil Properties and Qualities

Texture: Surface layer and subsoil—sand or very gravelly sand; substratum—sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly lower landscape positions
• The well drained, coarse-loamy Typic Dystrochrepts that have a sandy substratum; in landscape positions similar to those of the major soils
• The moderately well drained, coarse-loamy Entic Fragiorthods in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMV
Secondary habitat type: None assigned

538D—Entic Haplorthods, sandy substratum, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Soil Properties and Qualities

Texture: Surface layer and subsoil—sand or very gravelly sand; substratum—sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly lower landscape positions
• The well drained, coarse-loamy Typic Dystrochrepts that have a sandy substratum; in landscape positions similar to those of the major soils
• The moderately well drained, coarse-loamy Entic Fragiorthods in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMV
Secondary habitat type: None assigned

539B—Karlin sandy loam, very deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 1 inch—dark brown sandy loam
Subsurface layer:
1 to 3 inches—brown loamy sand
Subsoil:
3 to 8 inches—dark brown, friable sandy loam
8 to 36 inches—strong brown and brown, friable and very friable sand
36 to 61 inches—brown, mottled, loose sand
Substratum:
61 to 95 inches—light brown, mottled sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderately rapid in the upper part, rapid in the lower part
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: 6 to 10 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Karlin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the lower landscape positions
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly lower landscape positions
Similar inclusions:
• Soils that are sand or loamy sand in the upper part of the subsoil

Use and Management

Land use: Woodland
Major management concerns: None

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 3A
Michigan soil management group: 4a
Primary habitat type: AQV
Secondary habitat type: None assigned

540B—Entic Fragiorthods-Typic Fragiaquods-Borosaprists, nonacid, complex, nearly level and undulating

Setting

Landform and position on the landform: Entic Fragiorthods—nearly level and undulating areas on ground moraines; Typic Fragiaquods—drainageways on ground moraines; Borosaprists—depressions on ground moraines
Slope: 0 to 6 percent
Distinctive landscape features: Cradle-knoll landscape
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Soil Properties and Qualities

Texture: Entic Fragiorthods—loamy or sandy; Typic Fragiaquods—loamy or sandy; Borosaprists—16 to more than 51 inches of well decomposed organic material over loamy or sandy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Entic Fragiorthods—moderately well drained; Typic Fragiaquods—somewhat poorly drained; Borosaprists—very poorly drained
Seasonal high water table: Entic Fragiorthods—perched at a depth of 1 to 2 feet at some time from November through May; Typic Fragiaquods—perched at a depth of 0.5 foot to 1.5 feet at some time from September through May; Borosaprists—1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Entic Fragiorthods and Typic Fragiaquods—slow; Borosaprists—very slow or ponded
Flooding: None

Composition

Entic Fragiorthods and similar soils: 55 to 65 percent
Typic Fragiaquods and similar soils: 15 to 20 percent
Borosaprists and similar soils: 15 to 20 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained Gogebic soils in the slightly higher landscape positions; associated with the Entic Fragiorthods

Similar inclusions:
• Soils that are darker in the upper part of the subsoil; associated with the Entic Fragiorthods
• Soils that have less than 16 inches of organic material; associated with the Borosaprists

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen or have an adequate snow cover.
• Because of wetness and low strength, special harvesting equipment is needed in areas of the Borosaprists. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Special site preparation, such as bedding, can reduce the seedling mortality rate in areas of the Entic Fragiorthods and Typic Fragiaquods.
• Trees are not planted in areas of the Borosaprists because of wetness, severe seedling mortality, and plant competition.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: Entic Fragiorthods—TMC-D; Typic Fragiaquods—TMC; Borosaprists—TTS
Secondary habitat type: None assigned

541—Fluvaquents, frequently flooded

Setting

Landform and position on the landform: Levees on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 100 acres

Soil Properties and Qualities

Texture: 1 to 7 inches of organic material over silty clay loam to sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Slow
Flooding: Frequent

Composition

Fluvaquents and similar soils: 100 percent

Inclusions

Similar inclusions:
• Soils that have 8 to 16 inches of organic material on the surface

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or midwinter, when the soils are frozen or have an adequate snow cover.
• Because of wetness, flooding, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: FMC
Secondary habitat type: None assigned

542B—Gogebic fine sandy loam, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on end moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Organic mat:
0 to 2 inches—dark reddish brown, decomposed organic material

Subsurface layer:
2 to 7 inches—reddish gray fine sandy loam

Subsoil:
7 to 21 inches—dark reddish brown and reddish brown, friable fine sandy loam
21 to 28 inches—a fragipan of reddish brown, mottled, very firm loamy fine sand and fine sandy loam
28 to 37 inches—reddish brown, firm fine sandy loam

Substratum:
37 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Gogebic soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the lower landscape positions
• The poorly drained, nonacid, very stony Humaquepts in depressions

Similar inclusions:
• Soils that have more clay in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

542D—Gogebic fine sandy loam, rolling

Setting

Landform and position on the landform: Rolling areas on end moraines
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Organic mat:
0 to 2 inches—dark reddish brown, decomposed organic material

Subsurface layer:
2 to 7 inches—reddish gray fine sandy loam

Subsoil:
7 to 21 inches—dark reddish brown and reddish brown, friable fine sandy loam
21 to 28 inches—a fragipan of reddish brown, mottled, very firm loamy fine sand and fine sandy loam
28 to 37 inches—reddish brown, firm fine sandy loam

Substratum:
37 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Gogebic soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods on foot slopes and in drainageways
• The poorly drained, nonacid, very stony Humaquepts in depressions

Similar inclusions:
• Soils that have more clay in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3W
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

542F—Gogebic fine sandy loam, well drained, hilly

Setting

Landform and position on the landform: Hilly areas on end moraines
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Organic mat:
0 to 2 inches—dark reddish brown, decomposed organic material
Subsurface layer:
2 to 7 inches—reddish gray fine sandy loam
Subsoil:
7 to 21 inches—dark reddish brown and reddish brown, friable fine sandy loam
21 to 28 inches—a fragipan of reddish brown, mottled, very firm loamy fine sand and fine sandy loam
28 to 37 inches—reddish brown, firm fine sandy loam
Substratum:
37 to 60 inches—reddish brown sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Gogebic soil and similar soils: 100 percent

Inclusions

Similar inclusions:
• Soils that have more clay in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 3a-af
Primary habitat type: ATD
Secondary habitat type: None assigned

543A—Haplaquods, nearly level

Setting

Landform and position on the landform: Drainageways on ground moraines and outwash plains
Slope: 0 to 3 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 30 acres

Soil Properties and Qualities

Texture: Sandy or loamy material
Depth class: Very deep
Permeability: Moderate to rapid
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: 1 to 2 feet below the surface at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Haplaquods and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained, nonacid Borohemists and Borosaprists in depressions
• The moderately well drained, coarse-loamy Entic Fragiorthods in the slightly higher landscape positions
• The moderately well drained Entic Haplorthods that have a moderately deep water table; in the slightly higher landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMC
Secondary habitat type: TTS

544C—Haplorthods, esker, rolling

Setting

Landform and position on the landform: Rolling areas on eskers
Slope: 6 to 12 percent
Shape of areas: Long and narrow
Size of areas: 4 to 40 acres

Soil Properties and Qualities

Texture: Loamy, sandy, or gravelly material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Haplorthods and similar soils: 100 percent

Inclusions

Similar inclusions:
• Well drained, loamy soils that have a dense layer in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

544D—Haplorthods, esker, hilly

Setting

Landform and position on the landform: Rolling and hilly areas on eskers
Slope: 12 to 25 percent
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres

Soil Properties and Qualities

Texture: Loamy, sandy, or gravelly material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Haplorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils in landscape positions similar to those of the Haplorthods

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

544F—Haplorthods, esker, steep

Setting

Landform and position on the landform: Steep and very steep areas on eskers
Slope: 35 to 60 percent
Shape of areas: Long and narrow
Size of areas: 5 to 80 acres

Soil Properties and Qualities

Texture: Loamy, sandy, or gravelly material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None

Composition

Haplorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
• Because of the slope, ordinary crawler tractors and rubber-tired skidders cannot be operated safely. As a result, special logging methods, such as yarding the logs with a cable, may be needed.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

545B—Haplorthods, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on end moraines
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Soil Properties and Qualities

Texture: Sandy or loamy over sandy materials or mixtures of sand and gravel
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Haplorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils and the moderately well drained, coarse-loamy Alfic Fragiorthods; in landscape positions similar to those of the Haplorthods
• The somewhat poorly drained Haplaquods in the lower landscape positions

Use and Management

Land use: Woodland
• Onsite investigation is needed to determine the suitability of these soils for woodland management and for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

545D—Haplorthods, rolling

Setting

Landform and position on the landform: Rolling areas on end moraines
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 1,500 acres

Soil Properties and Qualities

Texture: Sandy or loamy over sandy materials or mixtures of sand and gravel
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow or medium
Flooding: None

Composition

Haplorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils in landscape positions similar to those of the Haplorthods
• The somewhat poorly drained, nearly level Haplaquods on foot slopes and in drainageways

Use and Management

Land use: Woodland

Management measures:
• Onsite investigation is needed to determine the suitability of these soils for woodland and for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

545F—Haplorthods, hilly

Setting

Landform and position on the landform: Hilly areas on end moraines
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Soil Properties and Qualities

Texture: Sandy or loamy over sandy materials or mixtures of sand and gravel
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Haplorthods and similar soils: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• The well drained Gogebic soils in landscape positions similar to those of the Haplorthods

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying

out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Onsite investigation is needed to determine the suitability of these soils for woodland and for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: ATD
Secondary habitat type: None assigned

546C—Entic Haplorthods, esker, rolling

Setting

Landform and position on the landform: Rolling areas on eskers
Slope: 6 to 12 percent
Shape of areas: Long and narrow
Size of areas: 5 to 60 acres

Soil Properties and Qualities

Texture: Gravelly sandy loam 20 to 40 inches thick over extremely gravelly sand or extremely cobbly coarse sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 to 100 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• Small areas of the somewhat poorly drained, nearly level Haplaquods in the lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

546D—Entic Haplorthods, esker, hilly and steep

Setting

Landform and position on the landform: Hilly areas on eskers
Slope: 18 to 35 percent
Shape of areas: Long and narrow
Size of areas: 5 to 60 acres

Soil Properties and Qualities

Texture: Gravelly sandy loam 20 to 40 inches thick over extremely gravelly sand or extremely cobbly coarse sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 to 100 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
• Small areas of the somewhat poorly drained, nearly level Haplaquods on foot slopes and in drainageways

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

546F—Entic Haplorthods, esker, very steep

Setting

Landform and position on the landform: Steep and very steep areas on eskers
Slope: 35 to 60 percent
Shape of areas: Long and narrow
Size of areas: 5 to 40 acres

Soil Properties and Qualities

Texture: Gravelly sandy loam 20 to 40 inches thick over extremely gravelly coarse sand or extremely cobbly coarse sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium or rapid
Flooding: None

Composition

Entic Haplorthods and similar soils: 100 percent

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Cable yarding systems are generally safer than other logging methods and result in less surface disturbance.
• Because of the slope, ordinary crawler tractors and rubber-tired skidders cannot be operated safely. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

547B—Haplorthods, very deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines and outwash plains
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: 8 to 48 inches of loamy material over fine sand to coarse sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: 6 to 10 feet below the surface at some time from November through March
Surface runoff: Slow
Flooding: None

Composition

Haplorthods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, coarse-loamy Entic Fragiorthods that have a dense subsoil; in landscape positions similar to those of the Haplorthods

Similar inclusions:
• Well drained soils that are sandy throughout

Use and Management

Land use: Woodland

Management measures:
• Because of the variable nature of these soils, onsite investigation is needed to determine the suitability for woodland and for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TM
Secondary habitat type: None assigned

548—Humaquepts-Terric Borosaprists, nonacid, complex, frequently flooded

Setting

Landform and position on the landform: Levees on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: Humaquepts—0 to 16 inches of organic material over 25 to 35 inches of loamy material underlain by sand and gravel; Terric Borosaprists—16 to 40 inches of well decomposed organic material over sandy or loamy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Humaquepts—poorly drained; Terric Borosaprists—very poorly drained
Seasonal high water table: Humaquepts—near the surface to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: Frequent

Composition

Humaquepts and similar soils: 45 to 55 percent
Terric Borosaprists and similar soils: 45 to 55 percent

Inclusions

Similar inclusions:
• Soils that have more than 40 inches of organic material

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation, seedling mortality, windthrow hazard
Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Because of wetness and low strength, special harvesting equipment is needed in areas of the Terric Borosaprists. The equipment can be used only during periods when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted on these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: FMC
Secondary habitat type: None assigned

549B—Karlin-Pence complex, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam
Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam
Subsoil:
3 to 24 inches—brown, friable fine sandy loam
24 to 35 inches—yellowish red, very friable loamy sand
Substratum:
35 to 60 inches—brown sand

Pence

Organic mat:
0 to 1 inch—black, partially decomposed forest litter
Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam
Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand
Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Karlin—moderate in the upper part and rapid in the lower part; Pence—moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Karlin—somewhat excessively drained; Pence—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Karlin soil and similar soils: 40 to 55 percent
Pence soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained, nearly level Haplaquods in the slightly lower landscape positions
- The moderately well drained Gogebic soils that have a dense subsoil; in landscape positions similar to those of the major soils

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: None

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, droughtiness

Management measures:
- Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
- Conservation tillage, grassed waterways, cover crops, and crop rotations that include grasses or legumes help to control water erosion.
- Contour farming and contour stripcropping reduce the runoff rate and the hazard of water erosion.
- No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
- Irrigation water should be applied at a rate that ensures optimum production but does not increase deep percolation, the runoff rate, and the hazard of erosion.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Karlin—3A; Pence—3A
Michigan soil management group: Karlin—4a; Pence—4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

549D—Karlin-Pence complex, rolling

Setting

Landform and position on the landform: Rolling areas on outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 24 inches—brown, friable fine sandy loam
24 to 35 inches—yellowish red, very friable loamy sand

Substratum:
35 to 60 inches—brown sand

Pence

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam

Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand

Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Karlin—moderate in the upper part and rapid in the lower part; Pence—moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Karlin—somewhat excessively drained; Pence—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Karlin soil and similar soils: 40 to 55 percent
Pence soil and similar soils: 40 to 50 percent

Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils that have a dense subsoil; in landscape positions similar to those of the major soils

Use and Management

Land use: Dominant use—woodland; other uses—cropland

Woodland

Major management concerns: Equipment limitation on landings

Management measures:
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Cropland

Major management concerns: Soil blowing, water erosion, low organic matter content, seasonal droughtiness

Management measures:
• Conservation tillage, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing.
• Water erosion can be controlled by diversions, crop residue management, contour stripcropping, field stripcropping, cover crops, grassed waterways, conservation tillage, crop rotations, grade-stabilization structures, or a combination of these practices.
• No-till farming, crop residue management, and a cropping sequence that includes green manure crops increase the organic matter content.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, permeability, and the rate of water infiltration.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Karlin—3A; Pence—3A
Michigan soil management group: Karlin—4a; Pence—4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

549F—Karlin-Pence complex, hilly

Setting

Landform and position on the landform: Hilly areas on outwash plains
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Karlin

Surface layer:
0 to 2 inches—black fine sandy loam

Subsurface layer:
2 to 3 inches—reddish gray fine sandy loam

Subsoil:
3 to 24 inches—brown, friable fine sandy loam
24 to 35 inches—yellowish red, very friable loamy sand

Substratum:
35 to 60 inches—brown sand

Pence

Organic mat:
0 to 1 inch—black, partially decomposed forest litter

Subsurface layer:
1 to 4 inches—light brownish gray fine sandy loam

Subsoil:
4 to 20 inches—dark brown, friable fine sandy loam and sandy loam
20 to 33 inches—strong brown, loose gravelly sand

Substratum:
33 to 60 inches—dark yellowish brown, stratified gravelly coarse sand and sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Karlin—moderate in the upper part and rapid in the lower part; Pence—moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Drainage class: Karlin—somewhat excessively drained; Pence—well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None

Composition

Karlin soil and similar soils: 40 to 55 percent
Pence soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Gogebic soils that have a dense subsoil; in landscape positions similar to those of the major soils

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Karlin—3R; Pence—3R
Michigan soil management group: Karlin—4a; Pence—4a-a
Primary habitat type: TM
Secondary habitat type: None assigned

550—Terric Borosaprists, nonacid, frequently flooded

Setting

Landform and position on the landform: Levees on flood plains
Slope: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Soil Properties and Qualities

Texture: 16 to 40 inches of well decomposed organic material over sandy or loamy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Very poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: Frequent

Composition

Terric Borosaprists and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained, nonacid, very stony Humaquepts in landscape positions similar to those of the Terric Borosaprists

Similar inclusions:
• Soils that have more than 40 inches of organic material

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard, seedling mortality

Management measures:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Because of wetness, severe seedling mortality, and plant competition, trees are not planted in areas of these soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: FMC
Secondary habitat type: None assigned

551A—Typic Fragiorthods, nearly level, stony

Setting

Landform and position on the landform: Nearly level areas on end moraines
Slope: 0 to 2 percent
Shape of areas: Long and narrow or irregular
Size of areas: 5 to 80 acres

Soil Properties and Qualities

Texture: 30 to 50 inches of sandy loam to very gravelly or very cobbly silt loam over loamy sand to gravelly sandy loam
Depth class: Very deep
Rock fragments on the surface: Kind—rounded stones; percentage of surface covered—0.01 to 0.1
Permeability: Variable

Available water capacity: Variable
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from November through May
Surface runoff: Slow
Flooding: None

Composition

Typic Fragiorthods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Monico soils in the slightly lower landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when snow cover is adequate or the soil is frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: AVO
Secondary habitat type: None assigned

552F—Kalkaska sand, banded substratum, hilly

Setting

Landform and position on the landform: Hilly areas on outwash plains
Slope: 18 to 35 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 1 inch—very dark gray sand

Subsurface layer:
1 to 5 inches—brown sand

Subsoil:
5 to 19 inches—dark brown, very friable sand
19 to 50 inches—strong brown, friable sand
50 to 58 inches—strong brown, mottled, friable sand

Substratum:
58 to 90 inches—light brown, mottled fine sand that has bands of strong brown loamy fine sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Kalkaska soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the lower landscape positions

Similar inclusions:
• Soils that are lighter colored in the upper part of the subsoil

Use and Management

Land use: Woodland

Major management concerns: Erosion hazard, equipment limitation, seedling mortality

Management measures:
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 3R
Michigan soil management group: 5a
Primary habitat type: AQV
Secondary habitat type: None assigned

553D—Kalkaska loamy sand, rolling

Setting

Landform and position on the landform: Rolling areas on ground moraines, end moraines, and outwash plains
Slope: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 4 inches—dark reddish gray loamy sand
Subsoil:
4 to 16 inches—dark brown, very friable sand
16 to 32 inches—brown, very friable sand
32 to 58 inches—light brown, loose sand
Substratum:
58 to 95 inches—light brown sand

Soil Properties and Qualities

Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None

Composition

Kalkaska soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods on foot slopes and in drainageways
Similar inclusions:
• Soils that are sandy loam in the upper part of the subsoil
• Areas that are underlain by fine sand at a depth of more than 40 inches

Use and Management

Land use: Woodland
Major management concerns: Equipment limitation, seedling mortality
Management measures:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Planting seedlings that can withstand droughty conditions can lower the seedling mortality rate. Replanting is needed in some areas.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3A
Michigan soil management group: 5a
Primary habitat type: ATD
Secondary habitat type: None assigned

554B—Alfic Fragiorthods, coarse-loamy, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on ground moraines
Slope: 1 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Reference Profile

Organic mat:
0 to 2 inches—black, partially decomposed forest litter
Surface layer:
2 to 3 inches—black fine sandy loam
Subsurface layer:
3 to 7 inches—reddish gray fine sandy loam
Subsoil:
7 to 19 inches—reddish brown, friable very fine sandy loam
19 to 30 inches—a fragipan of reddish brown and dark reddish brown, mottled, very firm very fine sandy loam and loam
30 to 40 inches—dark reddish brown, firm loam
Substratum:
40 to 60 inches—reddish brown fine sandy loam

Soil Properties and Qualities

Depth class: Very deep
Permeability: Moderate in the upper part, very slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from October through May
Surface runoff: Slow
Flooding: None

Composition

Alfic Fragiorthods and similar soils: 5 to 10 percent
Contrasting inclusions: 90 to 95 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the slightly lower landscape positions
• The very poorly drained, nonacid Borosaprists in depressions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• Equipment can be used only during dry summer months and during periods in winter when the snow cover is adequate or the soil is frozen.
• Special site preparation, such as bedding, can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: None assigned
Primary habitat type: AVO
Secondary habitat type: None assigned

555B—Entic Haplorthods, very deep water table, nearly level and undulating

Setting

Landform and position on the landform: Nearly level and undulating areas on outwash plains and deltas
Slope: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Soil Properties and Qualities

Texture: 28 to 48 inches of sandy or loamy material over sand or gravelly sand
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Well drained
Seasonal high water table: 6 to 10 feet below the surface at some time from November through March
Surface runoff: Slow
Flooding: None

Composition

Entic Haplorthods and similar soils: 95 to 100 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, nearly level Haplaquods in the lower landscape positions

Use and Management

Land use: Woodland
• Because of the variability of these soils, onsite investigation is needed to determine the suitability for woodland and for other specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: TMV
Secondary habitat type: None assigned

556—Haplaquods, wet

Setting

Landform and position on the landform: Depressions on moraines and outwash plains
Shape of areas: Irregular
Size of areas: 5 to 10 acres

Soil Properties and Qualities

Texture: Sandy or loamy material
Depth class: Very deep
Permeability: Variable
Available water capacity: Variable
Drainage class: Poorly drained
Seasonal high water table: 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: None

Composition

Haplaquods and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Small areas of the somewhat poorly drained Haplaquods in the slightly higher landscape positions

Use and Management

Land use: Woodland

Major management concerns: Equipment limitation, seedling mortality, windthrow hazard

Management measures:
• The seasonal high water table restricts the use of equipment to midsummer, when the soils are dry, or

midwinter, when the soils are frozen or have an adequate snow cover.
- Site preparation methods, such as bedding, trenching, or mounding, can maximize growth and increase the seedling survival rate in new plantations.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by selective cutting and strip cutting.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary habitat type: PCS
Secondary habitat type: None assigned

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 65,000 acres in the county, or about 8 percent of the total acreage, meets the soil requirements for prime farmland. The map units in Iron County that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify as prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, foresters, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown under the heading "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Field crops commonly grown in the county are birdsfoot trefoil, red clover, alfalfa, bromegrass, oats, timothy, corn, and barley. Small acreages of strawberries, blueberries, raspberries, potatoes, and cabbage are also grown, and there are a few small apple orchards.

The annual number of frost-free days ranges from about 60 in the northwestern part of the county to about 110 in the southeast corner (Michigan Department of Agriculture, 1990). Crops that are adapted to short, cool growing seasons and the strongly acid soils should be selected. The crops that have potential for local and specialized markets include cabbage, buckwheat, apples, cranberries, raspberries, blackberries, blueberries, various herbs, canola, triticale, rape, kale, swedes, and turnips.

The production of crops can be improved if crop varieties are carefully selected and if the choice of growing sites includes consideration of soil conditions, such as water-holding capacity, drainage, maximum sun exposure, southern aspect, and cold air drainage.

The main management concerns affecting crop

production in the county include soil reaction, low fertility levels, the hazard of erosion, wetness, stoniness, droughtiness, the frost hazard, tilth, and the short, cool growing season.

Many of the soils in Iron County are acid and are low in natural fertility. Applications of lime and other fertilizers in a well managed program can correct both of these problems. On all soils, the amount of lime and fertilizer applied should be based on the results of laboratory soil tests. The Cooperative Extension Service can help to determine the amounts of fertilizer and lime that are needed by different crops for the desired yields.

Water erosion and *soil blowing* are hazards if the soils are not adequately protected. Vegetation and crop residue can provide a protective cover and thus reduce the hazard of erosion.

Erosion is damaging for several reasons. The surface layer is generally the most fertile part of the soil. As the surface layer is eroded away, productivity is reduced, plants become stunted, the seedling mortality rate increases, and the soil becomes more susceptible to further erosion. Erosion can also result in the sedimentation of culverts, drainage ditches, and streams. Sediments from cropland that enter streams and lakes commonly contain fertilizer and pesticides, which can further reduce water quality and alter the aquatic habitat.

The erodibility of a soil is dependent on surface texture, the length of slopes, and the slope gradient. Generally, as the slope increases the hazard of water erosion also increases. Soils that have clayey, silty, and loamy textures are more susceptible to water erosion than sandy soils. In Iron County, some of the soils that are susceptible to water erosion are Wabeno silt loam, Sarona fine sandy loam, Stambaugh silt loam, Padus fine sandy loam, and Sundog very fine sandy loam. Soils that have a sandy surface layer are susceptible to soil blowing. In Iron County, these include Vilas loamy sand, Au Gres sand, and Croswell sand.

Erosion-control practices provide protective cover, reduce the runoff rate, increase the rate of water infiltration, and reduce the amount of sediment that enters and clogs waterways.

Conservation tillage or minimum tillage systems leave crop residue on the surface. These tillage systems include crop rotations that maintain a sufficient amount of topsoil. Crop residue management maintains and enhances topsoil by incorporating species and varieties that produce high yields of residue. For example, grasses and grains produce more residue than legumes.

Green manure crops are grown explicitly for the purpose of improving fertility and maintaining the content of organic matter. They are incorporated into the soil while still green. Red clover and rye grass are commonly used as green manure crops. Any crop that is easily established, grows rapidly, and is easily eradicated may be used as a green manure crop. Legumes that are planted as a green manure crop can add nitrogen to the soil, thus reducing the need for nitrogen fertilizer.

Cover crops are seeded during final cultivation of a crop. After the main crop is harvested, the cover crop provides winter cover for erosion control. The cover crop retains nutrients that otherwise might be leached downward into the soil. Plants used as cover crops should have a growth period that allows them to reach maturity after the cash crop is removed.

Applications of animal manure can enhance topsoil, organic matter content, and fertility. Excessive amounts of agricultural waste can result in contamination of surface water and thus should be avoided in areas where the land slopes toward streams. Injection of manure below the soil surface can be effective in preventing the contamination of streams. Excessive application rates can also result in the contamination of ground water.

Contour cross-slope stripcropping involves growing crops in strips established on the contour or across the slope and arranged so that strips exposed to sheet and rill erosion are alternated with strips having protective cover. Cross-wind stripcropping involves growing crops in strips established at right angles to the prevailing wind and arranged so that strips exposed to wind erosion are alternated with strips having protective cover.

Grassed waterways are used to prevent the formation of gullies in areas where water is transported downslope in a concentrated flow. Subsurface drainage tile can be installed beneath the waterway to remove excess water as long as wetland conservation laws are not violated. This internal drainage enhances vegetative growth in the waterway and provides drier conditions for equipment use during field activities. Rocked crossings can also be built across waterways to provide convenient access to various fields.

Soil blowing, or wind erosion, can be a hazard on all unprotected soils, especially soils that have a sandy surface layer, such as Vilas, Keweenaw, Au Gres, and Croswell soils. Drained and unprotected areas of organic soils are also highly susceptible to soil blowing. Maintaining vegetative cover, applying surface mulch, and establishing field windbreaks of adapted trees and shrubs planted at right angles to the prevailing wind can reduce the hazard of soil blowing.

Wetness is a major management concern in many areas used for crops and pasture. Some soils are excessively wet because of a high water table resulting

from snowmelt, rain, floodwater, or landscape position. These wet soils are generally in low-lying areas and in depressions. Seed germination, plant growth, and the use of equipment can be adversely affected unless the excess water is removed. Soils that have a high water table are often subject to low soil temperature and a frost hazard, which can also hinder production.

Very poorly drained and poorly drained soils have a water table near or above the surface for much of the year and are generally not suited to crop production. Very poorly drained soils in Iron County include Cathro, Greenwood, Merwin, and Lupton soils. These soils have thick accumulations of organic material, and in undrained areas they have obvious wetland characteristics. Poorly drained soils include Waucedah, Minocqua, Kinross, and Witbeck soils.

Somewhat poorly drained soils may have a water table at a depth of 6 to 12 inches during excessively wet periods. Au Gres, Solona, Net, Channing, Gaastra, and Beechwood soils are examples of somewhat poorly drained soils.

Moderately well drained soils may have a water table at a depth of 12 to 30 inches during excessively wet periods. Champion and Wabeno soils that have slopes of less than 18 percent are examples. These soils have restricted permeability at a depth of about 24 inches. Moderately well drained soils that do not have a layer with restricted permeability include Fence soils that have slopes of less than 6 percent and Croswell and Manitowish soils. Small areas of wetter soils are commonly included with moderately well drained soils.

The design of surface and subsurface drainage systems varies with the kind of soil. Because of the frost hazard in areas of poorly drained and very poorly drained soils, most drainage systems have been installed in areas of somewhat poorly drained and moderately well drained soils. Surface drainage systems are often the most cost effective. Improving natural waterways, removing drainage obstructions, and installing diversions to redirect surface runoff can greatly improve drainage. Deeper drainage ditches can function well if adequate outlets are available. Subsurface tile drainage systems can be used to lower the water table; however, some soils have a fragipan that can interfere with tile drainage. Information about the design of drainage systems and the laws that protect wetlands is available from local offices of the Natural Resources Conservation Service and from local conservation districts.

Droughtiness during dry periods is a management concern in areas of sandy soils that have a low available water capacity. Crops may wither during the summer unless irrigation water is applied or drought-resistant crops are selected for planting. Examples of droughty soils in Iron County are Karlin, Vilas, Croswell, Keweenaw, Pence, and Manitowish soils. The moisture-holding capacity of these soils can be improved by increasing the organic matter content. No-till farming also conserves soil moisture.

The *frost hazard* can injure sensitive crops. Frost can occur in spring, in fall, and, occasionally, in summer. Freezing air from the higher altitudes falls because it is heavier than the lower warm air. The coldest air travels downslope to the lowest areas and accumulates, causing frost in lowlands and on flood plains.

The short, cool *growing season* limits the time during which crops can grow and mature. Cold soils inhibit seed germination. The aspect, or the direction in which a slope faces, has an important effect on soil temperature and crop growth. Soils on slopes that have a southern aspect warm up considerably more rapidly in the spring than those on slopes that face in other directions. Crops germinate and grow faster because of increased sunlight and soil temperatures. However, soils on south-facing slopes can lose soil moisture and become droughty earlier during the drier years. The effects of early germination and growth can be harmful to frost-sensitive plants.

Soil tilth affects the germination of seeds and the infiltration of water into the soils. It also influences the amount of water available to crops. Soils that have good tilth are granular and porous. In areas where tilth is poor, a crust may form on the surface after periods of intense rainfall. In soils that have a loamy surface layer, additions of organic material may be needed to maintain tilth. No-till methods of pasture and hayland seeding can maintain good soil tilth and conserve soil moisture.

Operating machinery or allowing grazing in areas of wet, loamy soils can result in compaction of the surface layer. Productivity is reduced on compacted soils because of increased soil density, which inhibits root penetration, and decreased pore space in the root zone, which reduces the amount of air and water available to plant roots.

Pasture management includes proper applications of fertilizer and lime. The applications should be based on the results of soil tests. Pasture rotation, deferred grazing, adequate water supplies for livestock, and the maintenance of the key forage species are other important aspects of pasture management. Many of the soils used for pasture are slowly permeable and dry slowly in the spring and after heavy rains. In areas of these soils, grazing during wet periods causes compaction and reduces yields. If possible, areas of better drained soils should be used during wet periods. Key forage species include birdsfoot trefoil and bromegrass on medium textured, moderately well drained soils; alfalfa, red clover, bromegrass, and

orchardgrass on coarse textured, well drained soils; and mixtures of birdsfoot trefoil and reed canarygrass on wet soils. For optimum production, alfalfa requires a nearly neutral soil. Alfalfa generally grows well in areas of Trenary and Oconto soils because of increased alkalinity at greater depths. In all pasture mixtures, legumes require proper applications of inoculant at planting time so that the nitrogen-forming bacteria can form root nodules.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

At the end of each map unit description under the heading "Detailed Soil Map Units," the Michigan soil management group is listed. The soils in each map unit are assigned to a group according to the dominant texture, the drainage class, and the main management concerns (Mokma and others, 1978). More detailed information about these groups is available from the local office of the Michigan State University Cooperative Extension Service.

Woodland Management and Productivity

Dennis Robinson, technical representative, Michigan Department of Agriculture, helped prepare this section.

The major concerns associated with use and management of woodland are discussed in this section. Also, the major forest habitat types are described and related to the different kinds of soils in the survey area.

Woodland makes up about 670,000 acres in Iron County, or about 90 percent of the total acreage. Approximately 62 percent of the forest land is privately owned. Federal, State, and local government agencies control more than 256,000 acres. A number of forest industry companies and other corporations own large acreages of woodland. Many small units that are owned by individuals also make up an important part of the forest resource of Iron County.

Woodland is the dominant land use on all but a few of the soils in the survey area. Many upland soils support northern hardwoods, such as sugar maple, red maple, basswood, and yellow birch. Black cherry, white ash, red oak, balsam fir, hemlock, white pine, white birch, and white spruce are also in some stands. Large areas support aspen or mixed northern hardwoods and aspen. Scattered areas support stands of jack pine, red pine, and white pine. Stands on the wetter soils are predominantly red maple, quaking aspen, balsam poplar, paper birch, and balsam fir.

Wooded areas in swamps are mostly balsam fir, black spruce, northern whitecedar, and tamarack. Red maple, quaking aspen, paper birch, and black ash are in some stands.

Erosion damage may occur as a result of site preparation and cutting operations where the soil is exposed along logging roads, skid roads, and fire lanes and in landing areas. Fire can also leave the soils susceptible to erosion. Erosion is generally a hazard on forest land if the slope is 18 percent or more. Establishing logging roads and skid roads on the contour helps to control erosion.

Soil wetness results from a high water table, flooding, or ponding. Excessive wetness increases the seedling mortality rate, limits the use of equipment, increases the invasion or growth of undesirable plants following harvest, and increases the likelihood of windthrow by restricting the rooting depth of some trees. Ruts form easily when wheeled skidders are used during wet periods. Deep ruts tend to restrict lateral drainage, damage tree roots, and alter soil structure and can result in a change in species composition and reduced yields. Wetness can be overcome by restricting woodland management activities to periods when the soils are dry or frozen or have adequate snow cover.

Droughtiness can also cause seedling mortality. Steep, south- and west-facing slopes may be especially droughty because of high temperatures and evaporation on these sites. Planting during moist soil conditions can reduce seedling losses. Seedling survival during dry seasons can be improved by planting large, vigorous nursery stock if natural regeneration is undesirable or insufficient. Special site preparation, such as furrowing, may also be needed. Using containerized planting stock may be necessary on very dry sites.

Slope, stoniness, and rock outcrops can limit the use of forestry equipment. Slope of 18 percent or more generally limits the use of equipment in logging areas and on skid roads and logging roads. Establishing logging roads and skid roads on the contour helps to overcome the slope. On the very steep slopes, track-type harvesting equipment cannot be operated safely and other systems must be used. Slope also influences the location of landings and log-handling areas. Level to undulating areas are the best locations for such sites. Stones, rock outcrops, and shallow bedrock can also be obstacles to the construction of logging roads. The location of logging roads should be carefully planned.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic

substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength in the spring thaw period and during periods of high rainfall. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand. The volumes listed in the table are determined from standard yield tables as referenced in the Natural Resources Conservation Service National Forestry Manual (USDA).

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Table 9 gives information about operating harvesting or thinning equipment in logging areas and on skid trails, log landings, and logging roads. Limitations are given for the most limiting season and for the preferred season. The *most limiting season* in this survey area generally is spring or late fall. In some areas, however, it is during dry periods in summer, when loose sand can limit trafficability on deep, well drained, sandy soils.

The *preferred operating season* is the period when harvesting or thinning causes the least amount of soil damage. This period generally is when the soil is not

too wet or when the ground is frozen or partly frozen or has adequate snow cover.

In table 9, a rating of *slight* indicates that the use of conventional logging equipment is not restricted if normal logging methods are used. A rating of *moderate* indicates that the use of equipment is restricted because of one or more soil factors. If wetness is a limitation, high flotation equipment or special procedures may be needed to prevent the formation of ruts. A rating of *severe* indicates that the kind of equipment that can be used is seriously restricted.

Logging areas and skid trails include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid trails, which generally are within the logging area, are roads or trails over which the logs are dragged or hauled from the stump to a log landing.

Landings are areas where logs are assembled for transportation (fig. 8). Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging.

Logging roads are access roads leading from primary or surfaced roads to the logging areas. The logging roads serve as transportation routes for wheeled logging equipment and logging trucks. Generally, they are unpaved roads. Some are graveled.

Forest Habitat Types

The information in this section is derived from a field guide developed for the Upper Peninsula of Michigan and for northeastern Wisconsin by Cooperative Research on Forest Soils (CROFS) and partially funded by the McIntire Stennis Act and Champion International (Coffman and others, 1980). The system of habitat classification used in the guide is based on the concept that plants occur in predictable patterns or communities and that these plant communities reflect differences in site characteristics.

Besides identifying the various habitat types by means of vegetative keys, the guide also provides suggested forest management practices for most of the habitat types. The successional stages depend largely on the amount and kind of forest disturbance. They include the succession after logging in the original climax stands, the succession after logging in the second-growth stands, and the succession in stands that have been both logged and burned.

The guide provides the suggested forest management for each of the successional stages. This management includes methods of thinning, harvesting, and site preparation and measures that improve regeneration of the stands. The potential productivity, in terms of a site index and the mean annual volume in cubic feet per acre per year, is given for most of the habitat types.

Habitat types have been determined for each map unit in the survey area. The primary habitat type is the one that is most common for the map unit. The secondary habitat type is less common. The following paragraphs describe the habitat types in the survey area. They provide information about the potential climax species, some of the common understory species, and the potential productivity, if known, of the habitat type.

AOC—Acer-Osmorhiza-Caulophyllum habitat type. This habitat type has a potential climax overstory dominated by sugar maple. Other species include eastern hemlock and American basswood. American elm, white ash, and eastern hophornbeam are in some areas. The dominant ground flora includes spinulose woodfern, blue cohosh, sweet cicely, common ladyfern, smooth yellow violet, Canada white violet, and downy yellow violet. The potential productivity for northern hardwoods is high.

AQV—Acer-Quercus-Vaccinium habitat type. This habitat type has a potential climax overstory dominated by red maple and northern red oak. Other species include eastern hemlock, eastern white pine, balsam fir, and white spruce. The dominant ground flora includes lowbush blueberry, Canada blueberry, brackenfern, wintergreen, bigleaf aster, and hazelnut. The potential productivity is moderately low for northern hardwoods, moderate for aspen, and moderately high for red pine and jack pine.

ATD—Acer-Tsuga-Dryopteris habitat type. This habitat type has a potential climax overstory dominated by sugar maple. Other species include eastern hemlock and American basswood. Yellow birch, red maple, and American elm are in some areas. The dominant ground flora includes spinulose woodfern, rosy twistedstalk, Solomons seal, scarlet elder, and Canada mayflower. The potential productivity is moderately high for northern hardwoods and high for aspen. The potential productivity for red pine plantations is high if plant competition is controlled.

ATD-CI—Acer-Tsuga-Dryopteris habitat type, Circaea-Impatiens phase. This habitat type has a potential climax overstory dominated by sugar maple. Other species include eastern hemlock and American basswood. Yellow birch, red maple, and American elm are in some areas. The dominant ground flora includes spinulose woodfern, rosy twistedstalk, Solomons seal, scarlet elder, Canada mayflower, jewelweed, and alpine circaea. The potential productivity is moderately high for northern hardwoods and high for aspen. The potential productivity for red pine plantations is high if plant competition is controlled.



Figure 8.—A large log landing in a forest clearing near a major all-season highway.

AVO—Acer-Viola-Osmorhiza habitat type. This habitat type has a potential climax overstory dominated by sugar maple. Other species include American basswood, white ash, yellow birch, eastern hophornbeam, eastern hemlock, and American elm. The dominant ground flora includes Canada white violet, sweet cicely, spinulose woodfern, ladyfern, Solomons seal, and rosy twistedstalk. The potential productivity is high for northern hardwoods and aspen. It also is high for red pine plantations if plant competition is controlled.

AVO-CI—Acer-Viola-Osmorhiza habitat type, Circaea-Impatiens phase. This habitat type has a potential climax overstory dominated by sugar maple. Other species include American basswood, white ash, yellow birch, eastern hophornbeam, eastern hemlock, and American elm. The dominant ground flora includes Canada white violet, sweet cicely, spinulose woodfern, ladyfern, Solomons seal, rosy twistedstalk, jewelweed, and alpine circaea. The potential productivity is high for northern hardwoods and aspen. It also is high for red pine plantations if plant competition is controlled.

FI—Fraxinus-Impatiens habitat type. This habitat type has a potential climax overstory dominated by white ash and red maple. Other species include sugar maple, black ash, and balsam fir. The dominant ground flora includes jewelweed, sedge, alpine circaea, spinulose woodfern, ladyfern, scarlet elder, and field mint. The potential productivity for northern hardwoods is moderate.

FMC—Fraxinus-Mentha-Carex habitat type. This habitat type has a potential climax overstory dominated by black ash and American elm. Other species include red maple and balsam fir. The dominant ground flora includes sedge, field mint, speckled alder, and jewelweed.

PCS—Picea-Chamadaphne-Sphagnum habitat type. This habitat type has a potential climax overstory dominated by black spruce. Other species include tamarack and northern whitecedar. The dominant ground flora includes leatherleaf, bog rosemary, pale laurel, sphagnum, Labrador tea ledum, sedge, and Canada blueberry.

TM—Tsuga-Maianthemum habitat type. This habitat type has a potential climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other species include yellow birch, white spruce, balsam fir,

eastern white pine, northern red oak, northern whitecedar, and American basswood. The dominant ground flora includes Canada mayflower, brackenfern, sedge, American starflower, and wild sarsaparilla. The potential productivity is moderate for northern hardwoods, moderately high for aspen, and high for red pine and jack pine.

TMC—Tsuga-Maianthemum-Coptis habitat type. This habitat type has a potential climax overstory dominated by eastern hemlock and red maple. Sugar maple and yellow birch are common. Other species include balsam fir, white spruce, and northern whitecedar. The dominant ground flora includes Canada mayflower, goldthread, yellow beadlily, bunchberry dogwood, American starflower, and spinulose woodfern. The potential productivity is moderate for northern hardwoods and aspen.

TMC-D—Tsuga-Maianthemum-Coptis habitat type, Dryopteris phase. This habitat type has a potential climax overstory dominated by eastern hemlock and red maple. Sugar maple and yellow birch are common. Other species include balsam fir, white spruce, and northern whitecedar. The dominant ground flora includes Canada mayflower, goldthread, yellow beadlily, bunchberry dogwood, American starflower, spinulose woodfern, long beechfern, oakfern, and Solomons seal. The potential productivity is moderate for northern hardwoods and aspen.

TMC-Vac—Tsuga-Maianthemum-Coptis habitat type, Vaccinium phase. This habitat type has a potential climax overstory dominated by eastern hemlock and red maple. Sugar maple and yellow birch are common. Other species include balsam fir, white spruce, and northern whitecedar. The dominant ground flora includes Canada mayflower, goldthread, yellow beadlily, bunchberry dogwood, American starflower, Canada blueberry, lowbush blueberry, and spinulose woodfern. The potential productivity is moderate for northern hardwoods and aspen.

TMV—Tsuga-Maianthemum-Vaccinium habitat type. This habitat type has a potential climax overstory dominated by eastern hemlock and red maple. Other species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, brackenfern, Canada mayflower, lowbush blueberry, yellow beadlily, and wood betony. The potential productivity is moderate for northern hardwoods, moderately high for aspen, and high for red pine and jack pine.

TTS—Tsuga-Thuja-Sphagnum habitat type. This habitat type has a potential climax overstory dominated by eastern hemlock and northern whitecedar. Other species include balsam fir, black spruce, and red maple. The dominant ground flora includes sphagnum, goldthread, bunchberry dogwood, sedge, Canada mayflower, American starflower, and wood sorrel.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 10 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Recreation is a major land use in Iron County. Much of the land in the county is used for extensive recreational activities, such as fishing, hunting, sightseeing, and observation of wildlife and plants. Winter recreational activities include cross-country skiing and snowmobiling. Some areas are used for intensive recreational activities. These include campgrounds, picnic areas, playgrounds, hiking trails, downhill skiing areas, and golf courses. As population and costs of land ownership increase, changes in land use will be likely. These changes may include more land being used for various types of recreation.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in

evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Lynn C. Sampson, biologist, Natural Resources Conservation Service, helped prepare this section.

The variety of wildlife species in an area depends upon complex relationships between soil, water, and vegetation. Wildlife populations are in balance with the essential elements of habitat, including food, cover, and water.

Habitat for wildlife in Iron County is diverse and ranges from heavily wooded areas to open farmland. Woodland habitats include lowland conifer (whitecedar, balsam fir, black spruce, tamarack), lowland hardwood (black ash, red maple), upland hardwood (sugar maple, American basswood, northern red oak), and aspen. Iron County has many streams and inland lakes and wetland areas that support diverse populations of fish and wildlife. Wetland habitat includes large areas of lowland shrub (speckled alder, sweet gale, dwarf birch) and acid bogs (leatherleaf, Labrador tea) and smaller areas of marsh.

Before European settlement, black bear, mountain lions, caribou, moose, and timber wolf roamed the survey area. The marten and fisher were abundant in the forests. Because of logging and agricultural development starting in the middle 1800's, species adapted to second-growth forest, brushy edges, and agricultural areas became abundant. Populations of white-tailed deer, red fox, and raccoons increased.

The heavily wooded areas in the county provide important habitat for white-tailed deer, ruffed grouse, and eastern wild turkey. These areas also provide food and cover for black bear, raccoons, skunks, tree squirrels, grosbeaks, warblers, and woodpeckers. The farmed areas and associated idle areas of grass and brush are inhabited by coyote, woodchuck, red fox, raccoon, hawks, owls, and numerous songbirds. The wooded streams and diverse wetlands provide habitat for blue herons, green herons, bald eagles, belted kingfishers, woodcock, marsh hawks, beaver, and mink.

The streams and lakes of Iron County support good populations of sunfish, perch, largemouth bass, smallmouth bass, walleye, northern pike, and bullheads. The rivers and streams provide an abundance of trout.

The plant and animal communities of Iron County include many species recognized by the State of Michigan as rare, threatened, or endangered. These species include the common loon, bald eagles, osprey, red-shouldered hawk, marten, and assiniboia sedge.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are buckwheat, corn, wheat, sorghum, millet, oats, and rye.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchardgrass, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bunchberry dogwood, goldenrod, wild cicely, lambsquarters, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, cherry, maple, apple, hawthorn, dogwood, raspberry, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are swamp milkweed, spotted joepyeweed, wild rice, marshmarigold, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland,

pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include sharp-tailed grouse, kestrel, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, porcupine, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to

bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in

the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of groundwater pollution. Ease of excavation and revegetation should be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for

commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and bedrock.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones, boulders, or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that

impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

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Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

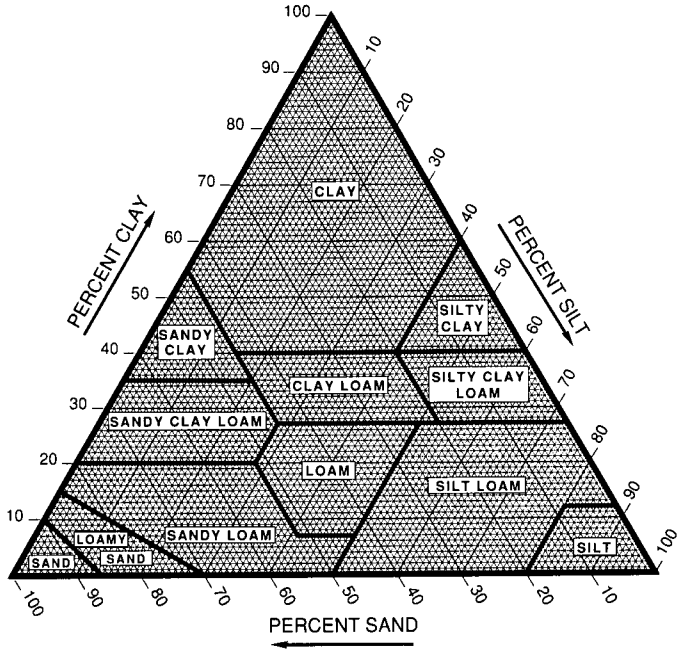


Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and

highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for

fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained

sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 19, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Characterization Data for Selected Soils

A few of the soils in Iron County were sampled by the Soil Research Laboratory, Michigan Technological University, Houghton, Michigan, and the Soil Survey Laboratory, Lincoln, Nebraska. The laboratory data obtained from the soil samples include analyses of particle-size distribution, coarse fragments, bulk density, and moisture retention. Complete chemical analyses were also performed on each sample, and spodic horizon criteria were determined on the appropriate samples. Standard procedures of the National Cooperative Soil Survey were used for all of the analyses.

These data were used in classifying and correlating the soils and in evaluating their behavior, especially under forestry uses. Six profiles were selected as representative of their series or family. The series or family and the laboratory identification numbers are as follows: coarse-loamy, mixed, frigid Typic Fragiorthods (S82MI-071-001); Peavy (S88MI-071-001 and S88MI-071-002); and Wabeno (S82MI-071-001, S87MI-071-001, and S87MI-071-002).

In addition to the Iron County data, soil characterization data and forest site data are available from nearby counties that have many of the same soils as Iron County. These data and the Iron County data are available from the Soil Research Laboratory, the Soil and Water Conservation Division of the Michigan Department of Agriculture, and the Natural Resources Conservation Service.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Orthod (*Orth*, meaning the common ones, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplorthods (*Hapl*, meaning minimal horizonation, plus *orthod*, the suborder of the Spodosols that has a horizon of accumulation of aluminum, iron, and organic carbon in which no one of the elements dominates).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Entic Haplorthods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, frigid Entic Haplorthods.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series or higher taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alfic Fragiorthods, Coarse-Loamy

These soils are coarse-loamy, mixed, frigid Alfic Fragiorthods. They are very deep, moderately well drained soils on ground moraines. The soils formed in

loamy material and in the underlying loamy and sandy glacial till. They are shallow or moderately deep to a fragipan. Permeability is moderate in the upper part of the profile, very slow in the fragipan, and moderate or moderately rapid in the lower part. Slopes range from 1 to 35 percent.

Reference pedon of Alfic Fragiorthods, coarse-loamy, nearly level and undulating, 450 feet north and 1,050 feet east of the center of sec. 26, T. 46 N., R. 37 W.

Oe—0 to 2 inches; black (5YR 2/1), partially decomposed forest litter; weak fine granular structure; very friable; many fine to coarse roots; very strongly acid; abrupt wavy boundary.

A—2 to 3 inches; black (5YR 2/1) fine sandy loam, gray (5YR 5/1) dry; weak fine granular structure; friable; many fine and few medium roots; about 5 percent gravel; very strongly acid; abrupt wavy boundary.

E—3 to 7 inches; reddish gray (5YR 5/2) fine sandy loam; weak fine granular structure; friable; many fine and few medium roots; about 5 percent gravel; very strongly acid; abrupt wavy boundary.

Bs—7 to 19 inches; reddish brown (5YR 4/4) very fine sandy loam; weak fine subangular blocky structure; friable; many fine and few medium roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Ex/Btx—19 to 30 inches; about 60 percent reddish brown (5YR 4/3) very fine sandy loam (E) surrounded by dark reddish brown (5YR 3/4) loam (Bt); common medium prominent strong brown (7.5YR 5/6) mottles; moderate thick platy structure; very firm; common vesicular pores; about 5 percent gravel; strongly acid; gradual wavy boundary.

Bt—30 to 40 inches; dark reddish brown (5YR 3/4) loam; weak medium subangular blocky structure; firm; many distinct reddish gray (5YR 5/2) clay films on faces of peds; about 5 percent gravel; moderately acid; gradual wavy boundary.

2C—40 to 60 inches; reddish brown (5YR 5/4) fine sandy loam; massive; friable; about 5 percent gravel and 4 percent cobbles; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the loamy mantle ranges from 14 to 32 inches. The thickness of the solum ranges from 35 to 72 inches. Depth to the fragipan ranges from 14 to 30 inches. The content of gravel ranges from 1 to 5 percent in the solum and from 1 to 10 percent in the substratum. The content of cobbles ranges from 0 to 10 percent in the solum and from 0 to 15 percent in the substratum.

The O horizon is less than 4 inches thick. It consists of hardwood and conifer litter in varying stages of decay.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3 and chroma of 0. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are fine sandy loam, loam, or silt loam.

Some pedons have a Bhs horizon. This horizon has hue of 5YR or 7.5YR, value of 3, and chroma of 2 or 3. The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. Value and chroma of 3 do not occur in the same pedon. The Bhs and Bs horizons are fine sandy loam, loam, silt loam, or very fine sandy loam.

The E part of the Ex/Btx horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is very fine sandy loam, fine sandy loam, sandy loam, or loamy sand. The Bt part has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is fine sandy loam, sandy loam, or loam. Some pedons have an Ex and a Btx horizon.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay, clay loam, silty clay loam, sandy clay loam, or loam.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly fine sandy loam, sandy loam, loamy sand, sand, or the gravelly or cobbly analogs of those textures. In some pedons, however, it has pockets or bands of sandy clay loam or clay loam.

Alstad Series

The Alstad series consists of very deep, somewhat poorly drained soils on ground moraines. These soils formed in loamy glacial till. Permeability is moderate in the solum and moderately slow in the substratum. Slopes range from 0 to 6 percent.

Typical pedon of Alstad loam, 0 to 6 percent slopes, 1,400 feet east and 1,060 feet south of the northwest corner of sec. 6, T. 43 N., R. 30 W.; in Dickinson County, Michigan:

A—0 to 4 inches; dark reddish brown (5YR 3/2) loam, gray (5YR 6/1) dry; weak medium granular structure; friable; about 2 percent gravel; moderately acid; abrupt wavy boundary.

Bs—4 to 16 inches; dark brown (7.5YR 4/4) loam; common fine distinct brown (7.5YR 5/2) mottles; weak fine subangular blocky structure; friable; about 2 percent gravel; moderately acid; abrupt wavy boundary.

E—16 to 21 inches; grayish brown (10YR 5/2) fine sandy loam; few fine distinct light brown (7.5YR 6/4) mottles; massive; firm; about 2 percent gravel; slightly acid; abrupt wavy boundary.

B/E—21 to 26 inches; about 85 percent reddish brown

(5YR 4/4) clay loam (Bt); common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; grayish brown (10YR 5/2) fine sandy loam (E) surrounding the Bt material; moderate medium subangular blocky structure; friable; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt—26 to 42 inches; reddish brown (5YR 4/4) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; dark reddish brown (5YR 3/3) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

C—42 to 60 inches; reddish brown (5YR 4/3) clay loam; massive; firm; about 3 percent gravel; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 56 inches. The content of gravel ranges from 0 to 15 percent throughout the profile. The content of cobbles ranges from 0 to 2 percent in the C horizon.

Some pedons have a thin Oe horizon. The A, Bs, and E horizons are loam, fine sandy loam, or sandy loam. The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loam or clay loam. The C horizon is sandy loam, loam, or clay loam. Some pedons are not effervescent.

Au Gres Series

The Au Gres series consists of very deep, somewhat poorly drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in sandy glacial outwash deposits. Slopes range from 0 to 3 percent.

Typical pedon of Au Gres sand, 0 to 3 percent slopes, 2,300 feet north and 100 feet east of the southwest corner of sec. 13, T. 42 N., R. 33 W.

A—0 to 3 inches; very dark gray (10YR 3/1) sand, dark gray (10YR 4/1) dry; moderate medium granular structure; very friable; many fine roots; strongly acid; abrupt wavy boundary.

E—3 to 7 inches; brown (7.5YR 4/2) sand; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; abrupt broken boundary.

Bs—7 to 15 inches; strong brown (7.5YR 4/6) sand; few fine distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; gradual wavy boundary.

BC—15 to 32 inches; brown (7.5YR 5/4) sand; common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; very friable; few fine roots; strongly acid; gradual wavy boundary.

C—32 to 60 inches; dark yellowish brown (10YR 4/4) sand that has few thin strata of coarse sand; single grain; loose; about 10 percent gravel; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 to 3. The A and E horizons are sand or loamy sand.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. The content of ortstein in this horizon is as much as 25 percent in some pedons. The Bs horizon is sand or loamy sand. Some pedons have a thin Bhs horizon. This horizon has value and chroma of 2 or 3. The BC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sand.

The C horizon has colors similar to those of the BC horizon. It is sand. Some pedons have thin strata of very fine sand below a depth of 40 inches.

Beechwood Series

The Beechwood series consists of very deep, somewhat poorly drained, moderately permeable soils on drumlinoid ground moraines. These soils formed in modified loamy eolian material and in the underlying sandy or loamy glacial till. Slopes range from 0 to 2 percent.

Typical pedon of Beechwood silt loam, nearly level, 5,940 feet east of Forest Highway 16 on Forest Road 303, 330 feet west and 200 feet south of the northeast corner of sec. 12, T. 43 N., R. 37 W.; in Stambaugh Township:

Oa—0 to 2 inches; dark yellowish brown (10YR 3/4), well decomposed organic material; moderate fine granular structure; very friable; many fine and medium and few coarse roots; few fine irregular segregated dark brown (7.5YR 3/2) accumulations of iron; extremely acid; abrupt smooth boundary.

E—2 to 4 inches; grayish brown (10YR 5/2) silt loam; many fine distinct yellowish brown (10YR 5/6) and many common faint very dark grayish brown (10YR 3/2) organic stains; weak medium platy structure; friable; many fine and medium and few very fine roots; about 5 percent cobbles; few fine rounded

segregated dark brown (7.5YR 3/2) concretions of iron and manganese; very strongly acid; abrupt smooth boundary.

Bw1—4 to 18 inches; brown (10YR 4/3) silt loam; many common distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine and medium roots; about 5 percent cobbles; few fine rounded segregated dark brown (7.5YR 3/2) concretions of iron and manganese; very strongly acid; clear irregular boundary.

Bw2—18 to 34 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct yellowish brown (10YR 5/8) and few medium prominent light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; friable; common fine and very fine roots; about 3 percent cobbles; few fine rounded segregated dark brown (7.5YR 3/2) concretions of iron and manganese; strongly acid; gradual irregular boundary.

2Bw3—34 to 49 inches; dark yellowish brown (10YR 4/6) sandy loam; few fine faint yellowish brown (10YR 5/6) and common medium prominent light brownish gray (2.5Y 6/2) mottles; moderate thick platy structure; friable; few fine and very fine roots; about 10 percent cobbles; strongly acid; gradual wavy boundary.

2C—49 to 71 inches; reddish yellow (7.5YR 6/6) loamy sand; common medium prominent light brownish gray (2.5Y 6/2) mottles; massive; friable; about 10 percent cobbles and 5 percent gravel; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 40 to 51 inches. The content of gravel ranges from 0 to 5 percent in the E and Bw horizons and from 5 to 20 percent in the 2Bw and 2C horizons. The content of cobbles ranges from 0 to 5 percent in the E and Bw horizons and from 5 to 15 percent in the 2Bw and 2C horizons.

Some pedons have an A horizon. This horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are silt loam.

The Bw and 2Bw horizons have hue of 7.5YR or 10YR. The Bw horizon has value of 4 to 6, and the 2Bw horizon has value of 4 or 5. The Bw and 2Bw horizons are silt loam, loam, sandy loam, or fine sandy loam.

The 2C horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is loamy sand, sandy loam, or the gravelly or cobbly analogs of those textures. In some pedons it has pockets or strata of sand or loam.

Cathro Series

The Cathro series consists of very deep, very poorly drained soils on ground moraines, outwash plains, and flood plains. These soils formed in highly decomposed herbaceous and woody material overlying loamy glacial till and outwash. Permeability is moderately slow to moderately rapid in the organic material and moderate or moderately slow in the loamy material. Slopes are 0 to 1 percent.

Typical pedon of Cathro muck, in an area of Lupton-Cathro-Humaquepts complex; 1,400 feet south and 120 feet west of the center of sec. 12, T. 41 N., R. 31 W.

Oa1—0 to 7 inches; muck, black (5YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak medium granular structure; many fine roots; herbaceous fibers; moderately acid; clear wavy boundary.

Oa2—7 to 26 inches; muck, black (5YR 2/1) broken face and rubbed; about 50 percent fiber, 15 percent rubbed; massive; common fine and medium roots; herbaceous fibers; moderately acid; abrupt wavy boundary.

C1—26 to 30 inches; dark gray (5YR 4/1) very fine sandy loam; massive; friable; moderately acid; clear wavy boundary.

C2—30 to 60 inches; brown (10YR 5/3) fine sandy loam; massive; friable; about 5 percent gravel; slightly acid.

Depth to the C horizon ranges from 16 to 51 inches. Woody fragments are in some pedons.

The organic material has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. It is dominantly sapric material but has thin layers of hemic material in some pedons.

The C horizon is silt loam, fine sandy loam, very fine sandy loam, or the gravelly analogs of those textures. The content of gravel ranges from 0 to 25 percent.

Champion Series

The Champion series consists of very deep, well drained and moderately well drained soils on ground moraines and end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. They are shallow or moderately deep to a fragipan. Permeability is moderate above the fragipan, very slow in the fragipan, and moderate or moderately rapid in the substratum. Slopes range from 1 to 35 percent.

Typical pedon of Champion very fine sandy loam, 1

to 6 percent slopes, very stony, 1,580 feet west and 1,320 feet south of the northeast corner of sec. 18, T. 46 N., R. 33 W.

Oe—0 to 1 inch; black (N 2/0), partially decomposed forest litter; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—1 to 4 inches; gray (5YR 5/1) very fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; about 5 percent cobbles and 5 percent gravel; strongly acid; clear wavy boundary.

Bhs1—4 to 7 inches; dark reddish brown (5YR 3/3) very fine sandy loam; weak fine and medium subangular blocky structure; very friable; many fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; clear wavy boundary.

Bhs2—7 to 11 inches; dark brown (7.5YR 3/3) very fine sandy loam; weak fine and medium subangular blocky structure; friable; many fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; clear wavy boundary.

Bs1—11 to 16 inches; dark brown (7.5YR 3/4) very fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; gradual wavy boundary.

Bs2—16 to 20 inches; brown (7.5YR 4/4) very fine sandy loam; weak thin platy structure; friable; common fine and medium roots; about 8 percent gravel and 5 percent cobbles; strongly acid; clear smooth boundary.

2Ex—20 to 26 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; many coarse prominent dark yellowish brown (10YR 4/6) mottles; moderate medium platy structure; extremely firm; few fine roots; many fine vesicular pores; about 20 percent gravel and 5 percent cobbles; moderately acid; gradual wavy boundary.

2Bx/Ex—26 to 49 inches; about 70 percent dark brown (7.5YR 3/3) gravelly fine sandy loam (B) surrounded by dark grayish brown (10YR 4/2) gravelly fine sandy loam (E); weak very thick platy structure; extremely firm; many fine vesicular pores; common faint brown (7.5YR 4/4) silt and clay coatings in pebble casings and pores; about 25 percent gravel and 5 percent cobbles; moderately acid; diffuse wavy boundary.

2C—49 to 60 inches; grayish brown (10YR 5/2) gravelly fine sandy loam; massive; friable; about 20 percent gravel and 5 percent cobbles; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 30 to 70 inches. The thickness of the eolian material ranges from 16 to 24 inches. Depth to the fragipan ranges from 14 to 24 inches. The content of gravel ranges from 3 to 10 percent in the A, E, and B horizons and from 15 to 30 percent in the 2Ex, 2Bx/Ex, and 2C horizons. The content of cobbles ranges from 3 to 20 percent in the A, E, and B horizons and from 0 to 10 percent in the 2Ex, 2Bx/Ex, and 2C horizons. The content of stones on the surface ranges from 0.01 to 0.3 percent.

Some pedons have an A horizon. This horizon has hue of 5YR to 10YR, value of 2 to 4, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 1 or 2. The A and E horizons are silt loam, very fine sandy loam, or the cobbly analogs of those textures.

The Bhs horizon has hue of 2.5YR to 7.5YR, value of 3, and chroma of 2 or 3. The Bs horizon has hue of 2.5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. The Bhs and Bs horizons are silt loam, very fine sandy loam, fine sandy loam, or the cobbly analogs of those textures.

The 2Ex horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2. The E part of the 2Bx/Ex horizon has colors similar to those of the 2Ex horizon. The B part has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 or 4.

The 2C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. The 2Ex, 2Bx/Ex, and 2C horizons are gravelly fine sandy loam, gravelly sandy loam, gravelly loamy sand, or gravelly loamy fine sand. They have pockets and lenses of gravelly sand in some pedons.

Channing Series

The Channing series consists of very deep, somewhat poorly drained soils on outwash plains and stream terraces. These soils formed in modified loamy eolian deposits overlying sandy glacial outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Channing very fine sandy loam, in an area of Minocqua-Channing complex, 0 to 3 percent slopes; 500 feet south and 1,200 feet west of the center of sec. 15, T. 45 N., R. 33 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) very fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; strongly acid; abrupt smooth boundary.

E—7 to 9 inches; grayish brown (10YR 5/2) very fine sandy loam; many fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular

blocky structure; friable; moderately acid; abrupt broken boundary.

Bs1—9 to 16 inches; dark yellowish brown (10YR 3/4) very fine sandy loam; many fine prominent strong brown (7.5YR 5/6) and many fine faint brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; about 1 percent gravel; moderately acid; clear wavy boundary.

Bs2—16 to 24 inches; dark yellowish brown (10YR 4/4) very fine sandy loam; many medium distinct yellowish brown (10YR 5/6) and common fine prominent yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; friable; about 2 percent gravel; moderately acid; clear wavy boundary.

2C1—24 to 28 inches; strong brown (7.5YR 5/6) sand; single grain; loose; moderately acid; abrupt smooth boundary.

2C2—28 to 43 inches; brown (10YR 4/3) loamy sand; massive; very friable; moderately acid; abrupt smooth boundary.

2C3—43 to 60 inches; brown (10YR 4/3), stratified coarse sand and very gravelly sand; single grain; loose; about 35 percent gravel; moderately acid.

The thickness of the solum ranges from 15 to 30 inches. The content of gravel ranges from 0 to 10 percent in the solum and averages 15 to 50 percent in the substratum. The content of cobbles ranges from 0 to 10 percent throughout the profile.

In areas that have not been cultivated, the A horizon is 1 to 3 inches thick. It has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. The Ap, A, and E horizons are very fine sandy loam or fine sandy loam.

The Bs horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 4 to 6. It is very fine sandy loam or fine sandy loam.

The C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It is typically stratified loamy sand, sand, coarse sand, and the gravelly and very gravelly analogs of those textures.

Croswell Series

The Croswell series consists of very deep, moderately well drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in sandy glacial outwash deposits. Slopes range from 0 to 3 percent.

Typical pedon of Croswell sand, in an area of Karlin, moderately wet-Croswell complex, 0 to 3 percent slopes; 1,700 feet south and 210 feet east of the northwest corner of sec. 20, T. 42 N., R. 32 W.

A—0 to 1 inch; black (5YR 2/1) sand, dark gray (5YR 4/1) dry; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt wavy boundary.

E—1 to 5 inches; reddish gray (5YR 5/2) sand; single grain; loose; many fine and medium roots; very strongly acid; abrupt wavy boundary.

Bs1—5 to 8 inches; dark reddish brown (5YR 3/4) sand; single grain; loose; many fine and medium roots; about 15 percent weakly cemented ortstein; strongly acid; clear wavy boundary.

Bs2—8 to 20 inches; yellowish red (5YR 4/6) sand; single grain; loose; common fine and medium roots; strongly acid; gradual wavy boundary.

C—20 to 60 inches; brown (7.5YR 5/4) sand; common medium distinct strong brown (7.5YR 5/6) mottles; single grain; loose; few fine and medium roots; moderately acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 5 percent throughout the profile, and the content of cobbles ranges from 0 to 2 percent.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 or 2. The A and E horizons are sand or loamy sand.

The Bs horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6. Some pedons have a thin Bhs horizon. The Bs and Bhs horizons are sand.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 5. It is sand.

Ensley Series

The Ensley series consists of very deep, poorly drained soils on ground moraines and end moraines. These soils formed in loamy glacial till. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes are 0 to 1 percent.

Typical pedon of Ensley fine sandy loam, stony, 2,350 feet south and 2,620 feet west of the northeast corner of sec. 20, T. 43 N., R. 29 W.; in Dickinson County, Michigan:

A—0 to 3 inches; black (7.5YR 2/0) fine sandy loam, very dark gray (N 3/0) dry; moderate medium granular structure; friable; about 3 percent gravel and cobbles; neutral; abrupt smooth boundary.

EB—3 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; about 5 percent gravel and cobbles; neutral; clear wavy boundary.

Bw—9 to 20 inches; dark yellowish brown (10YR 4/4)

fine sandy loam; many medium distinct reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; friable; about 8 percent gravel and cobbles; neutral; clear wavy boundary.

C1—20 to 30 inches; yellowish brown (10YR 5/4) fine sandy loam; common medium distinct reddish yellow (7.5YR 6/6) mottles; massive; friable; about 7 percent gravel and cobbles; neutral; gradual wavy boundary.

C2—30 to 46 inches; brown (7.5YR 5/4) fine sandy loam; massive; friable; about 9 percent gravel and cobbles; slightly alkaline; clear wavy boundary.

C3—46 to 60 inches; strong brown (7.5YR 4/6) fine sandy loam; massive; friable; about 10 percent gravel and cobbles; slightly alkaline.

The thickness of the solum ranges from 15 to 35 inches. The content of coarse fragments ranges from 2 to 15 percent throughout the profile. The content of stones on the surface ranges from 0.01 to 0.1 percent.

Some pedons have a thin Oa horizon. The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 1 or 2 and chroma of 0 to 2. It is fine sandy loam or mucky fine sandy loam. The EB horizon has hue of 10YR or 2.5Y and value of 2 to 6.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is sandy loam or fine sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 6. It is dominantly sandy loam or fine sandy loam, but in some pedons it has thin layers of loamy sand or sand. It has free carbonates in some pedons.

Entic Fragiorthods, Coarse-Loamy

These soils are coarse-loamy, mixed, frigid Entic Fragiorthods. They are very deep, moderately well drained soils on ground moraines. The soils formed in loamy and sandy glacial till. They have a fragipan. Permeability is moderate in the upper part of the profile, very slow in the fragipan, and moderate or moderately rapid in the sandy substratum. Slopes range from 1 to 6 percent.

Reference pedon of Entic Fragiorthods, coarse-loamy, nearly level and undulating, 1,800 feet north and 600 feet east of the center of sec. 2, T. 46 N., R. 35 W.

Oe—0 to 2 inches; dark reddish brown (5YR 3/2), partially decomposed forest litter; abrupt smooth boundary.

A—2 to 4 inches; very dark gray (5YR 3/1) very fine sandy loam, gray (5YR 5/1) dry; weak medium granular structure; friable; many fine and medium roots; about 3 percent gravel and 2 percent cobbles; very strongly acid; abrupt wavy boundary.

E—4 to 8 inches; reddish gray (5YR 5/2) very fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 3 percent gravel and 2 percent cobbles; very strongly acid; abrupt wavy boundary.

Bs1—8 to 10 inches; dark reddish brown (5YR 3/4) very fine sandy loam; weak fine subangular blocky structure; friable; many fine and common medium roots; about 3 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

Bs2—10 to 21 inches; dark brown (7.5YR 4/4) very fine sandy loam; weak fine subangular blocky structure; friable; common medium roots; about 3 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

2Ex/Bx—21 to 35 inches; about 60 percent dark grayish brown (10YR 4/2) gravelly loamy sand (E); many coarse prominent dark yellowish brown (10YR 4/6) mottles; peds of dark brown (7.5YR 3/2) gravelly sandy loam (B) surrounded by the E material; moderate thick platy structure; very firm; about 20 percent gravel and 5 percent cobbles; strongly acid; diffuse wavy boundary.

2C—35 to 60 inches; grayish brown (10YR 5/2) gravelly loamy sand; about 20 percent gravel; single grain; loose; strongly acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 32 to 52 inches. Depth to the fragipan ranges from 14 to 25 inches. The content of rock fragments ranges from 5 to 30 percent in the A, E, and Bs horizons and from 5 to 40 percent in the 2Ex/Bx and 2C horizons.

The O horizon consists of undecomposed to decomposed conifer and hardwood litter.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR and value of 4 or 5. The A and E horizons are fine sandy loam, loam, very fine sandy loam, sandy loam, silt loam, or the gravelly or cobbly analogs of those textures.

The Bs horizon has hue of 5YR or 7.5YR and value of 3 or 4. It is fine sandy loam, very fine sandy loam, sandy loam, loam, silt loam, or the gravelly or cobbly analogs of those textures.

The E part of the 2Ex/Bx horizon has hue of 7.5YR or 10YR and chroma of 2 or 3. It is fine sandy loam, sandy loam, gravelly loamy sand, or very gravelly loamy sand. The B part has value of 3 or 4 and chroma of 2 to 4. It is fine sandy loam, sandy loam, or the gravelly or very gravelly analogs of those textures.

The 2C horizon has value of 4 or 5 and chroma of 2

to 4. It is loamy sand, fine sandy loam, sandy loam, or the gravelly or very gravelly analogs of those textures.

Entic Haplorthods, Coarse-Loamy

These soils are coarse-loamy, mixed, frigid Entic Haplorthods. They are very deep, moderately well drained soils on deltas, alluvial fans, and terraces and in small glacial drainageways. Permeability is moderate in the upper part and rapid in the lower part. The soils formed in loamy glacial drift. Slopes range from 0 to 6 percent.

Reference pedon of Entic Haplorthods, coarse-loamy, deep water table, nearly level and undulating, 270 feet east and 800 feet north of the southwest corner of sec. 23, T. 44 N., R. 36 W.

Oe—0 to 1 inch; black (5YR 2/1), partially decomposed hardwood and conifer litter; abrupt smooth boundary.

A—1 to 2 inches; black (5YR 2/1) fine sandy loam, gray (5YR 5/1) dry; weak medium granular structure; friable; many fine and few medium roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

E—2 to 8 inches; reddish gray (5YR 5/2) fine sandy loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

Bhs—8 to 10 inches; dark reddish brown (5YR 3/3) fine sandy loam; weak fine subangular blocky structure; friable; many fine and common medium roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.

Bs1—10 to 19 inches; dark reddish brown (5YR 3/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and few medium roots; about 1 percent gravel; strongly acid; gradual wavy boundary.

Bs2—19 to 30 inches; reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; few medium roots; about 1 percent gravel; strongly acid; clear wavy boundary.

2BC—30 to 47 inches; yellowish red (5YR 4/6) sand; single grain; loose; few medium and fine roots; about 3 percent gravel; moderately acid; diffuse wavy boundary.

2C—47 to 60 inches; reddish brown (5YR 5/4) sand that has thin bands of reddish brown (5YR 4/4) sandy loam as much as ¾ inch thick; common medium distinct yellowish red (5YR 5/8) mottles; single grain; loose; about 3 percent gravel; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 40 to 60 inches. The content of rock fragments ranges from 1 to 20 percent in the solum and from 3 to 30 percent in the substratum. Depth to the sandy material ranges from 27 to 35 inches.

The O horizon consists of undecomposed to decomposed conifer and hardwood litter.

The A horizon has hue of 5YR or 7.5YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2. The E horizon has hue of 5YR or 7.5YR and value of 4 or 5. The A and E horizons are sandy loam, fine sandy loam, loam, silt loam, or the gravelly analogs of those textures.

The Bhs horizon, if it occurs, has hue of 5YR or 7.5YR and value and chroma of 2 or 3. It is less than 3 inches thick. The Bs horizon has hue of 5YR or 7.5YR and value of 3 or 4. The Bhs and Bs horizons are sandy loam, fine sandy loam, loam, silt loam, or the gravelly analogs of those textures.

The 2BC horizon has hue of 5YR or 7.5YR and chroma of 4 to 6. It is sand, loamy sand, coarse sand, or the gravelly analogs of those textures.

The 2C horizon has hue of 5YR or 7.5YR and chroma of 4 to 8. It is sand, loamy sand, coarse sand, or the gravelly analogs of those textures.

Entic Haplorthods, Sandy

These soils are sandy, mixed, frigid Entic Haplorthods. They are very deep, somewhat excessively drained soils on outwash plains. Permeability is moderately rapid in the solum and very rapid in the substratum. The soils formed in sandy outwash deposits. Slopes range from 0 to 18 percent.

Reference pedon of Entic Haplorthods, sandy, stratified substratum, rolling, 1,450 feet south and 600 feet west of the northeast corner of sec. 6, T. 46 N., R. 35 W.

A—0 to 1 inch; black (N 2/0) sandy loam; weak fine granular structure; friable; many very fine and fine and common medium and coarse roots; about 2 percent gravel; very strongly acid; abrupt smooth boundary.

E—1 to 2 inches; reddish gray (5YR 5/2) loamy sand; weak fine granular structure; very friable; many fine and medium and common very fine and coarse roots; about 2 percent gravel; very strongly acid; abrupt broken boundary.

Bs1—2 to 6 inches; reddish brown (5YR 4/4) loamy sand; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; many fine, common medium, and few coarse roots;

about 2 percent gravel; moderately acid; abrupt wavy boundary.
Bs2—6 to 19 inches; yellowish red (7.5YR 4/6) gravelly coarse sand; single grain; loose; few fine roots; about 15 percent gravel; moderately acid; gradual wavy boundary.
BC—19 to 41 inches; light brown (7.5YR 6/4) sand; single grain; loose; few fine roots; about 5 percent gravel; moderately acid; gradual wavy boundary.
C—41 to 60 inches; light brown (7.5YR 6/4) sand that has strata of fine sand, loamy fine sand, and gravelly coarse sand; single grain; loose; about 10 percent gravel; moderately acid.

The thickness of the solum ranges from 20 to 45 inches. Depth to the sandy material ranges from 0 to 22 inches. The content of gravel ranges from 0 to 15 percent in the solum and from 0 to 30 percent in the substratum.

Some pedons have an O horizon, which consists of undecomposed to decomposed conifer and hardwood litter. The Oa horizon, if it occurs, has hue of 5YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1.

The A horizon has hue of 7.5YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are sandy loam, loamy sand, or sand.

The Bs1 horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. The Bs2 horizon has hue of 5YR or 7.5YR and value and chroma of 4 to 6. These horizons are loamy sand, sand, coarse sand, or the gravelly analogs of those textures.

The BC horizon has hue of 5YR or 7.5YR and value and chroma of 4 to 6. It is sand, loamy sand, coarse sand, or loamy coarse sand.

The C horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 4 or 5. It is stratified sand, fine sand, gravelly coarse sand, coarse sand, or the gravelly analogs of those textures.

Entic Haplorthods, Sandy-Skeletal

These soils are sandy-skeletal, mixed, frigid Entic Haplorthods. They are very deep, well drained soils on end moraines and eskers. Permeability is moderate in the solum and rapid in the underlying material. The soils formed in loamy and gravelly sandy glacial drift. Slopes range from 0 to 50 percent.

Reference pedon of Entic Haplorthods, sandy-skeletal, rolling and hilly, 1,620 feet west and 2,180 feet north of the southeast corner of sec. 24, T. 46 N., R. 36 W.

Oe—0 to 2 inches; partially decomposed conifer and hardwood litter; abrupt smooth boundary.
E—2 to 5 inches; brown (7.5YR 5/2) cobbly sandy loam; weak fine subangular blocky structure; friable; common fine and few medium and coarse roots; about 8 percent cobbles and 8 percent gravel; strongly acid; abrupt wavy boundary.
Bs1—5 to 18 inches; dark brown (7.5YR 3/4) gravelly sandy loam; weak fine subangular blocky structure; friable; common fine and few medium and coarse roots; about 16 percent gravel and 14 percent cobbles; moderately acid; gradual wavy boundary.
2Bs2—18 to 52 inches; dark yellowish brown (10YR 4/4) extremely cobbly coarse sand; single grain; loose; few fine and medium roots; about 55 percent cobbles and 20 percent gravel; moderately acid; gradual wavy boundary.
2C—52 to 65 inches; very dark grayish brown (10YR 3/2) extremely cobbly coarse sand; single grain; loose; about 40 percent cobbles and 25 percent gravel; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 28 to 56 inches. Depth to the sandy material ranges from 8 to 22 inches. The content of rock fragments ranges from 5 to 50 percent in the upper part of the solum and from 35 to 80 percent in the lower part of the solum and in the substratum.

The O horizon consists of undecomposed to decomposed conifer and hardwood litter.

Some pedons have an A horizon. This horizon is as much as 2 inches thick. The A and E horizons are sandy loam, fine sandy loam, silt loam, or the gravelly, cobbly, very gravelly, or very cobbly analogs of those textures.

The Bs horizon has hue of 7.5YR or 5YR and value of 3 or 4. It has textures similar to those of the A and E horizons. The 2Bs horizon has hue of 7.5YR or 10YR and value of 3 or 4. It is the very gravelly, very cobbly, extremely gravelly, or extremely cobbly analogs of sand, coarse sand, and loamy sand.

The 2C horizon has value of 3 to 5 and chroma of 2 to 6. It has textures similar to those of the 2Bs horizon.

Escanaba Series

The Escanaba series consists of very deep, well drained soils on ground moraines and end moraines. These soils formed in sandy and loamy glacial till. Permeability is moderately rapid in the upper part of the profile and moderate in the lower part. Slopes range from 1 to 6 percent.

Typical pedon of Escanaba loamy fine sand, 1 to 6

percent slopes, 800 feet south of the northeast corner of sec. 23, T. 43 N., R. 31 W.

A—0 to 1 inch; black (5YR 2/1) loamy fine sand, very dark gray (5YR 3/1) dry; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.
E—1 to 9 inches; reddish gray (5YR 5/2) loamy fine sand; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; clear irregular boundary.
Bs1—9 to 24 inches; dark reddish brown (5YR 3/4) loamy fine sand; weak medium subangular blocky structure; very friable; many fine and medium roots; moderately acid; gradual wavy boundary.
Bs2—24 to 28 inches; strong brown (7.5YR 4/6) loamy fine sand; weak medium subangular blocky structure; friable; weakly cemented; common fine and medium roots; moderately acid; clear wavy boundary.
2B/E—28 to 36 inches; about 80 percent reddish brown (5YR 4/4) fine sandy loam (B) surrounded by dark reddish gray (5YR 4/2) loamy fine sand (E); moderate coarse subangular blocky structure; firm; few fine roots; few fine vesicular pores; about 5 percent gravel; moderately acid; clear wavy boundary.
2Bt—36 to 49 inches; dark reddish brown (5YR 3/4) fine sandy loam; weak coarse subangular blocky structure; friable; few fine roots; few fine vesicular pores; common reddish brown (5YR 4/4) clay films in pebble casings and pores; about 10 percent gravel; neutral; gradual wavy boundary.
2C—49 to 60 inches; reddish brown (5YR 4/4) fine sandy loam; massive; friable; about 10 percent gravel; slightly alkaline.

The thickness of the solum ranges from 24 to 50 inches. The thickness of the sandy upper part of the solum ranges from 20 to 35 inches. The content of gravel ranges from 0 to 10 percent in the solum and from 3 to 12 percent in the substratum. The content of cobbles ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are loamy fine sand or fine sand.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. It is loamy fine sand, fine sand, loamy sand, or sand. The E part of the 2B/E horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 or 3. It is loamy fine sand, loamy sand, or fine sand. The B part of the 2B/E horizon and the 2Bt horizon have hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 4 or 5. They are fine sandy loam or sandy loam.

The 2C horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 5. It is fine sandy loam or sandy loam.

Fence Series

The Fence series consists of very deep, moderately well drained and well drained, moderately slowly permeable soils on outwash plains and ground moraines. These soils formed in modified loamy eolian deposits. Slopes range from 1 to 18 percent.

Typical pedon of Fence silt loam, 1 to 2 percent slopes, 1,250 feet west and 2,500 feet north of the southeast corner of sec. 18, T. 42 N., R. 33 W.

A—0 to 2 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; many fine roots; moderately acid; abrupt wavy boundary.
E—2 to 5 inches; brown (7.5YR 4/2) silt loam; moderate thin platy structure; friable; common fine and medium roots; moderately acid; clear wavy boundary.
Bs—5 to 9 inches; dark brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; strongly acid; gradual irregular boundary.
E/B—9 to 27 inches; about 70 percent brown (7.5YR 5/4) silt loam (E) surrounded by reddish brown (5YR 4/4) silt loam (B); moderate medium platy structure; firm; common fine and medium roots; strongly acid; diffuse irregular boundary.
Bt—27 to 41 inches; reddish brown (5YR 4/4) silt loam; few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium platy structure; friable; few fine roots; few reddish brown (5YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.
C—41 to 60 inches; reddish brown (5YR 4/4) very fine sandy loam; many medium prominent brown (7.5YR 5/2) and many medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; strongly acid.

The thickness of the solum ranges from 30 to 60 inches. The content of gravel is less than 2 percent throughout the profile.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are silt loam or very fine sandy loam.

The Bs horizon has hue of 7.5YR or 5YR, value of 3

to 5, and chroma of 4 or 5. The E part of the E/B horizon has hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 2 to 4. The B part of the E/B horizon and the Bt horizon have hue of 7.5YR or 5YR and value and chroma of 4 or 5. The Bs, E/B, and Bt horizons are silt loam or very fine sandy loam.

The C horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It generally is silt loam, very fine sandy loam, or fine sandy loam, but in some pedons it has thin strata of sand, fine sand, and loamy fine sand.

Gaastra Series

The Gaastra series consists of very deep, somewhat poorly drained, moderately slowly permeable soils in glacial lake basins and on ground moraines. These soils formed in modified loamy eolian deposits. Slopes range from 0 to 3 percent.

Typical pedon of Gaastra silt loam, 0 to 3 percent slopes, stony, 1,650 feet east and 2,050 feet north of the southwest corner of sec. 11, T. 42 N., R. 35 W.

Oa—0 to 1 inch; black (N 2/0), well decomposed organic material; weak fine granular structure; very friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

A—1 to 4 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; about 2 percent gravel; moderately acid; abrupt smooth boundary.

E—4 to 6 inches; brown (7.5YR 5/2) silt loam; common fine distinct strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure parting to weak thin platy; friable; common fine vesicular pores; common fine and medium roots; about 2 percent gravel; moderately acid; clear wavy boundary.

Bs—6 to 14 inches; brown (7.5YR 4/4) silt loam; common fine prominent yellowish red (5YR 4/6) and common medium prominent dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; friable; common fine vesicular pores; common fine and medium roots; about 2 percent gravel; moderately acid; clear smooth boundary.

E′—14 to 22 inches; brown (10YR 5/3) silt loam; many coarse distinct brown (7.5YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate thick platy structure; slightly compact in place; friable; common fine vesicular pores; few fine roots; about 2 percent gravel; moderately acid; clear wavy boundary.

Bt—22 to 37 inches; dark yellowish brown (10YR 4/4) silt loam; many coarse prominent brown (7.5YR 5/2) and few medium prominent yellowish red (5YR 4/6) mottles; weak coarse subangular blocky structure parting to weak thick platy; slightly compact in place; friable; common fine vesicular pores; few fine roots; common reddish brown (5YR 4/4) clay films in pores and on faces of peds; about 2 percent gravel; moderately acid; gradual wavy boundary.

BC—37 to 51 inches; brown (7.5YR 4/4) silt loam; many medium distinct brown (7.5YR 5/2) and common medium distinct strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; slightly compact in place; friable; common fine vesicular pores; about 2 percent gravel; moderately acid; gradual wavy boundary.

C—51 to 60 inches; reddish brown (5YR 4/4) silt loam; common medium prominent strong brown (7.5YR 4/6) and few fine prominent brown (7.5YR 5/2) mottles; massive; slightly compact in place; friable; common fine vesicular pores; about 2 percent gravel; moderately acid.

Unless otherwise stated, depth ranges in this paragraph are measured from the top of the mineral soil. The thickness of the solum ranges from 26 to 55 inches. The content of gravel and cobbles is less than 5 percent throughout the profile.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. The A and E horizons are silt loam or very fine sandy loam.

The Bs horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4. The E′ horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 or 3. Some pedons have an E/B or a B/E horizon. The Bt and BC horizons have hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. The Bs, E′, Bt, and BC horizons are silt loam or very fine sandy loam.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam, very fine sandy loam, or fine sandy loam. In some pedons strata of sandy loam, loamy sand, sand, or the gravelly analogs of those textures are below a depth of 40 inches.

Gogebic Series

The Gogebic series consists of very deep, well drained and moderately well drained soils on end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. They have a fragipan. Permeability is moderate in the upper part of the profile, very slow in the fragipan, and moderate in the lower part. Slopes range from 1 to 35 percent.

Typical pedon of Gogebic fine sandy loam, rolling, 1,750 feet north and 2,600 feet east of the southwest corner of sec. 10, T. 45 N., R. 37 W.

Oa—0 to 2 inches; dark reddish brown (5YR 2/2), decomposed organic material; weak medium granular structure; very friable; many fine and few medium roots; very strongly acid; abrupt wavy boundary.

E—2 to 7 inches; reddish gray (5YR 5/2) fine sandy loam; weak fine subangular blocky structure; friable; many fine and few medium roots; about 3 percent gravel; strongly acid; abrupt smooth boundary.

Bs1—7 to 9 inches; dark reddish brown (5YR 3/3) fine sandy loam; weak fine subangular blocky structure; friable; many fine and few medium roots; about 3 percent gravel; strongly acid; abrupt wavy boundary.

Bs2—9 to 21 inches; reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; many fine and few medium roots; about 3 percent gravel; strongly acid; clear wavy boundary.

2Ex/Bx—21 to 28 inches; about 60 percent reddish brown (5YR 5/3) loamy fine sand (E) surrounded by reddish brown (2.5YR 4/4) fine sandy loam (B); common medium distinct yellowish red (5YR 4/6) mottles; weak thin platy structure; very firm; common vesicular pores; about 2 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

2Bt—28 to 37 inches; reddish brown (2.5YR 4/4) fine sandy loam; weak medium platy structure; firm; common distinct reddish gray (5YR 5/2) clay films on faces of plates; about 3 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

2C—37 to 60 inches; reddish brown (2.5YR 5/4) sandy loam; massive; friable; about 5 percent gravel and 3 percent cobbles; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the loamy mantle ranges from 15 to 28 inches. The thickness of the solum ranges from 30 to 70 inches. Depth to the fragipan ranges from 18 to 36 inches. The content of rock fragments ranges from 0 to 25 percent in the solum and from 0 to 30 percent in the substratum.

The O horizon ranges from 0 to 4 inches in thickness. It consists of hardwood and conifer litter in varying stages of decay.

Some pedons have an A horizon. This horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2.

The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is fine sandy loam, sandy loam, or the gravelly analogs of those textures.

The E part of the 2Ex/Bx horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is loamy fine sand, loamy sand, or the gravelly analogs of those textures. The B part has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, sandy loam, or the gravelly analogs of those textures. Some pedons have a 2Ex/Bx horizon or have a 2Ex and a 2Bx horizon.

The 2Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam, fine sandy loam, loam, or the gravelly analogs of those textures.

The 2C horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 to 6. It is dominantly sandy loam, gravelly loamy sand, gravelly sand, or gravelly sandy loam and has pockets of loam, clay loam, or fine sandy loam.

Goodman Series

The Goodman series consists of very deep, well drained, moderately permeable soils on ground moraines and end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. Slopes range from 1 to 45 percent.

Typical pedon of Goodman silt loam, in an area of Goodman-Wabeno-Sundog, sandy substratum, complex, 6 to 18 percent slopes, stony; 1,480 feet west and 200 feet north of the southeast corner of sec. 22, T. 45 N., R. 31 W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; about 3 percent gravel and 2 percent cobbles; moderately acid; abrupt wavy boundary.

E—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; many fine roots; about 3 percent gravel and 2 percent cobbles; moderately acid; abrupt wavy boundary.

2Bs—5 to 14 inches; dark brown (7.5YR 4/4) very fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 3 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

2E/B—14 to 33 inches; about 60 percent brown (7.5YR 5/4) very fine sandy loam (E) surrounding peds of dark brown (7.5YR 4/4) very fine sandy loam (Bt); weak medium subangular blocky structure; friable;

common fine and medium roots; few clay films in pebble casings and on faces of peds; about 3 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.

2B/E—33 to 49 inches; about 85 percent dark reddish brown (5YR 3/4) fine sandy loam (Bt) with reddish brown (5YR 5/4) loamy sand (E) on faces of most peds; weak medium subangular blocky structure; friable; few medium roots; many clay films in pebble casings and pores and on faces of some peds; about 8 percent gravel and 3 percent cobbles; strongly acid; gradual wavy boundary.

2C—49 to 60 inches; reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; few medium roots; about 8 percent gravel and 3 percent cobbles; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the eolian material ranges from 15 to 40 inches. The content of gravel ranges from 1 to 5 percent in the eolian mantle and from 5 to 10 percent in the glacial till. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are silt loam.

The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is silt loam. The E part of the 2E/B horizon has hue of 7.5YR, value of 4 to 6, and chroma of 2 to 4. The Bt part has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2E/B horizon is silt loam or very fine sandy loam. The 2B/E horizon has hue and value similar to those of the 2E/B horizon and has chroma of 3 or 4. The Bt part of the 2B/E horizon is fine sandy loam or sandy loam. The E part is loamy sand, sandy loam, or fine sandy loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, sandy loam, or loamy sand.

Greenwood Series

The Greenwood series consists of very deep, very poorly drained soils on ground moraines and outwash plains. These soils formed in moderately decomposed herbaceous material. Permeability is moderate or moderately rapid. Slopes are 0 to 1 percent.

Typical pedon of Greenwood peat, in an area of Greenwood and Merwin peats; 1,450 feet west and 2,700 feet south of the northeast corner of sec. 10, T. 42 N., R. 32 W.

Oi1—0 to 5 inches; peat, reddish brown (5YR 4/4) broken face and rubbed; about 100 percent fiber, 95 percent rubbed; massive; primarily live roots and sphagnum moss; extremely acid; clear wavy boundary.

Oi2—5 to 9 inches; peat, dark reddish brown (5YR 3/3) broken face, dark reddish brown (5YR 3/2) rubbed; about 95 percent fiber, 85 percent rubbed; massive; mainly sphagnum moss and herbaceous material; extremely acid; clear wavy boundary.

Oi3—9 to 18 inches; peat, dark brown (7.5YR 3/2) broken face, black (5YR 2/1) rubbed; about 95 percent fiber, 85 percent rubbed; massive; mainly sphagnum moss and herbaceous material; extremely acid; clear wavy boundary.

Oe1—18 to 25 inches; mucky peat, dark reddish brown (5YR 3/3) broken face, dark reddish brown (5YR 2/2) rubbed; about 80 percent fiber, 40 percent rubbed; massive; herbaceous fibers; extremely acid; gradual wavy boundary.

Oe2—25 to 52 inches; mucky peat, dark reddish brown (5YR 2/2) broken face, black (5YR 2/1) rubbed; about 80 percent fiber, 30 percent rubbed; massive; herbaceous fibers and a few woody fragments; extremely acid; gradual wavy boundary.

Oa—52 to 60 inches; muck, dark reddish brown (5YR 2/2) broken face, black (5YR 2/1) rubbed; about 40 percent fiber, 10 percent rubbed; massive; woody and herbaceous fibers; extremely acid.

The organic material is more than 51 inches thick. Woody fragments are in some pedons.

The Oi layer has hue of 5YR to 10YR, value of 2 to 5, and chroma of 1 to 4. The Oe layer has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 4. The surface tier is commonly fibric material derived from sphagnum moss. The lower tiers are commonly hemic material derived from herbaceous plants. Some pedons do not have an Oa layer.

Kalkaska Series

The Kalkaska series consists of very deep, somewhat excessively drained and well drained, rapidly permeable soils on outwash plains and ground moraines. These soils formed in sandy glacial drift. Slopes range from 0 to 35 percent.

Typical pedon of Kalkaska sand, banded substratum, hilly, 2,310 feet north and 990 feet east of the southwest corner of sec. 2, T. 46 N., R. 36 W.

A—0 to 1 inch; very dark gray (7.5YR 3/0) sand; moderate medium granular structure; friable; common fine to coarse roots; about 5 percent gravel; very strongly acid; abrupt irregular boundary.

E—1 to 5 inches; brown (7.5YR 5/2) sand; weak medium subangular blocky structure; very friable;

common fine to coarse roots; about 5 percent gravel; very strongly acid; abrupt wavy boundary.
Bhs—5 to 8 inches; dark brown (7.5YR 3/2) sand; weak medium subangular blocky structure; very friable; common fine to coarse roots; about 5 percent gravel; very strongly acid; clear irregular boundary.
Bs1—8 to 19 inches; dark brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common fine and medium and few coarse roots; about 5 percent gravel; strongly acid; clear wavy boundary.
Bs2—19 to 29 inches; strong brown (7.5YR 4/6) sand; massive; friable; few fine to coarse roots; about 5 percent gravel; strongly acid; clear smooth boundary.
BC—29 to 50 inches; strong brown (7.5YR 5/4) sand; massive; friable; few fine to coarse roots; about 5 percent gravel; moderately acid; clear smooth boundary.
C1—50 to 58 inches; strong brown (7.5YR 5/4) sand; weak thick platy structure; friable; few fine and medium roots; about 5 percent gravel; moderately acid; gradual wavy boundary.
C2—58 to 90 inches; light brown (7.5YR 6/4) sand that has bands of strong brown (7.5YR 5/8) fine sand and loamy fine sand at a depth of more than 84 inches; massive; about 5 percent gravel; moderately acid.

The thickness of the solum ranges from 26 to 55 inches. The content of rock fragments ranges from 0 to 10 percent throughout the solum.

Some pedons have an O horizon, which consists of undecomposed to decomposed conifer and hardwood litter. The Oa horizon, if it occurs, has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2.

The A horizon has hue of 5YR or 7.5YR, value of 2 to 4, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 2. The A and E horizons are sand or loamy sand.

The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3. It is sand or loamy sand. The Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It is sand. The BC horizon has hue of 7.5YR, value of 5, and chroma of 4 to 6. It is sand.

The C horizon has hue of 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is sand that has bands of loamy fine sand, fine sand, or loamy sand. Some pedons do not have bands of loamy fine sand at a depth of more than 40 inches.

Karlin Series

The Karlin series consists of very deep, somewhat excessively drained and moderately well drained soils on outwash plains, stream terraces, ground moraines, and end moraines. These soils formed in loamy and sandy glacial till and outwash deposits. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 35 percent.

Typical pedon of Karlin fine sandy loam, 1 to 6 percent slopes, 2,100 feet west and 1,580 feet south of the northeast corner of sec. 10, T. 42 N., R. 32 W.

A—0 to 2 inches; black (5YR 2/1) fine sandy loam, dark gray (5YR 4/1) dry; weak fine granular structure; friable; many fine roots; strongly acid; abrupt wavy boundary.
E—2 to 3 inches; reddish gray (5YR 5/2) fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; strongly acid; abrupt wavy boundary.
Bs1—3 to 10 inches; brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; strongly acid; clear wavy boundary.
Bs2—10 to 24 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 3 percent gravel; strongly acid; gradual wavy boundary.
BC—24 to 35 inches; yellowish red (5YR 4/6) loamy sand; weak medium subangular blocky structure; very friable; few fine roots; about 10 percent gravel; strongly acid; clear wavy boundary.
C—35 to 60 inches; brown (7.5YR 5/4) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent. The content of stones on the surface ranges from less than 0.01 to 0.1 percent.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. The A and E horizons are fine sandy loam or loamy fine sand.

The Bs horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. It is fine sandy loam, loamy fine sand, or sandy loam. The BC horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand, fine sand, or sand.

The C horizon has hue of 10YR to 5YR, value of 4 to 7, and chroma of 4 to 6. It is dominantly sand, but thin, discontinuous lamellae of loamy sand and sandy loam are below a depth of 40 inches in many pedons. Some pedons have mottles in the C horizon.

Keweenaw Series

The Keweenaw series consists of very deep, well drained, moderately permeable or moderately rapidly permeable soils on ground moraines and end moraines. These soils formed in sandy glacial till. Slopes range from 1 to 35 percent.

Typical pedon of Keweenaw loamy fine sand, 1 to 6 percent slopes, 600 feet north and 125 feet east of the southwest corner of sec. 26, T. 42 N., R. 31 W.

A—0 to 1 inch; black (5YR 2/1) loamy fine sand, very dark gray (5YR 3/1) dry; weak fine granular structure; very friable; many fine roots; moderately acid; abrupt wavy boundary.

E—1 to 6 inches; brown (7.5YR 5/2) loamy fine sand; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; abrupt wavy boundary.

Bs1—6 to 23 inches; yellowish red (5YR 4/6) loamy fine sand; weak medium subangular blocky structure; very friable; many fine and medium roots; moderately acid; clear wavy boundary.

Bs2—23 to 33 inches; yellowish red (5YR 4/6) loamy sand; weak medium subangular blocky structure; very friable; common fine and medium roots; about 5 percent gravel; moderately acid; clear wavy boundary.

2E/B—33 to 39 inches; about 70 percent brown (7.5YR 5/4) loamy sand (E) surrounding peds of dark reddish brown (5YR 3/4) sandy loam (Bt); weak medium subangular blocky structure; friable; common fine and medium roots; few reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent gravel; moderately acid; clear irregular boundary.

2E and Bt—39 to 60 inches; strong brown (7.5YR 5/6) loamy sand (E); weak coarse subangular blocky structure; very friable; thin bands of yellowish red (5YR 4/6) sandy loam (Bt) 1/8 to 3/8 inch thick; total thickness of the bands is more than 6 inches; massive; friable; few fine roots; few reddish brown (5YR 4/4) clay coatings in pebble casings; about 5 percent gravel; moderately acid.

The thickness of the solum ranges from 30 to more than 60 inches. The content of gravel ranges from 2 to 10 percent in the A, E, and Bs horizons and from 3 to 25 percent in the 2E/B and 2E and Bt horizons. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2. The A and E horizons are sandy loam, loamy fine sand, or loamy sand.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand or loamy fine sand. The E part of the 2E/B horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6. It is sand, loamy sand, loamy fine sand, or the gravelly analogs of those textures. The Bt part of this horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand, fine sandy loam, sandy loam, or the gravelly analogs of those textures. The 2E and Bt horizon has colors and textures similar to those of the 2E/B horizon.

Some pedons have a C horizon. This horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It ranges from uniform loamy sand to water-worked, interbedded sand and loamy sand that have bands or pockets of sandy loam. The gravelly analogs of those textures are in some pedons.

Kinross Series

The Kinross series consists of very deep, very poorly drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in sandy glacial outwash deposits. Slopes range from 0 to 2 percent.

Typical pedon of Kinross muck, 1,850 feet east and 600 feet north of the southwest corner of sec. 33, T. 44 N., R. 31 W.

Oa—0 to 5 inches; black (N 2/0) muck; weak medium granular structure; very friable; many fine roots; strongly acid; abrupt wavy boundary.

E1—5 to 10 inches; brown (7.5YR 5/2) fine sand; single grain; loose; few fine and medium roots; moderately acid; clear broken boundary.

E2—10 to 20 inches; brown (7.5YR 5/2) loamy fine sand; many coarse prominent strong brown (7.5YR 4/6) mottles; massive; very friable; few fine roots; moderately acid; clear irregular boundary.

Bhs—20 to 27 inches; dark brown (7.5YR 3/3) fine sand; single grain; loose; moderately acid; gradual wavy boundary.

Bs—27 to 40 inches; brown (7.5YR 4/4) fine sand; single grain; loose; moderately acid; diffuse wavy boundary.

BC—40 to 52 inches; brown (7.5YR 5/4) fine sand; common medium distinct strong brown (7.5YR 4/6) mottles; single grain; loose; moderately acid; diffuse wavy boundary.

C—52 to 60 inches; yellowish red (5YR 4/6) fine sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 16 to 55 inches.

The Oa horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Some pedons have an A horizon. This horizon is 1 to 6 inches thick. It has hue of 5YR to 10YR, value of 1 to 3, and chroma of 1 or 2. It is mucky sand, mucky fine sand, or mucky loamy sand. The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 to 3. It is sand, fine sand, loamy sand, or loamy fine sand.

The Bhs horizon has hue of 5YR to 10YR and value and chroma of 2 or 3. The Bs horizon has hue of 5YR to 10YR and value and chroma of 3 to 6. The Bhs and Bs horizons are sand, fine sand, or loamy sand. The BC horizon has hue of 5YR to 10YR and value and chroma of 4 to 6. It is sand or fine sand.

The C horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. It is sand or fine sand. In some pedons it has strata of coarse sand or fine gravel.

Lode Series

The Lode series consists of very deep, well drained soils on stream terraces, outwash plains, and deltas and in glacial drainageways. These soils formed in modified loamy eolian material and in the underlying sandy glacial outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slopes range from 1 to 35 percent.

Typical pedon of Lode silt loam, nearly level and undulating, 1,620 feet east and 20 feet south of the northwest corner of sec. 29, T. 44 N., R. 36 W.; in Iron River Township:

Ap—0 to 7 inches; dark brown (7.5YR 3/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; friable; many fine and few coarse roots; few very fine vesicular pores; about 1 percent gravel; strongly acid; abrupt wavy boundary.

Bs1—7 to 18 inches; dark brown (7.5YR 3/4) loam; weak medium subangular blocky structure; friable; common fine roots; few fine tubular pores; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs2—18 to 24 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine prominent yellowish red (5YR 4/6) mottles; very few fine roots; common fine tubular pores; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs3—24 to 31 inches; reddish brown (5YR 5/3) sandy loam; moderate thick platy structure; firm; few fine roots; common fine vesicular pores; few clay films on faces of peds; common coarse faint reddish brown (5YR 4/4) mottles; about 5 percent gravel; very strongly acid; clear wavy boundary.

2BC—31 to 37 inches; strong brown (7.5YR 4/6) coarse sand; single grain; loose; common fine roots; about 8 percent gravel; strongly acid; clear wavy boundary.

2C1—37 to 59 inches; brown (7.5YR 4/4) sand; single grain; loose; about 5 percent gravel; moderately acid; abrupt wavy boundary.

2C2—59 to 80 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; about 5 percent gravel; moderately acid.

The thickness of the solum ranges from 24 to 48 inches. The content of gravel ranges from 1 to 20 percent in the upper part of the solum and from 5 to 40 percent in the 2BC and 2C horizons. The content of cobbles ranges from 0 to 10 percent throughout the profile.

Pedons in undisturbed areas have an A horizon, which has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 or 2, and an E horizon, which has hue of 5YR or 7.5YR, value of 5, and chroma of 2 or 3.

The Bs1 and Bs2 horizons have hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 to 6. They are fine sandy loam, sandy loam, loam, or the gravelly analogs of those textures. The Bs3 horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. It is sandy loam, fine sandy loam, or the gravelly analogs of those textures.

The 2C horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. It is sand, coarse sand, or the gravelly or very gravelly analogs of those textures.

Lupton Series

The Lupton series consists of very deep, very poorly drained soils on ground moraines and outwash plains. These soils formed in highly decomposed herbaceous and woody material. Permeability is moderately slow to moderately rapid. Slopes are 0 to 1 percent.

Typical pedon of Lupton muck, in an area of Lupton-Cathro-Humaquepts complex, 1,300 feet east and 420 feet south of the northwest corner of sec. 5, T. 41 N., R. 32 W.

Oa1—0 to 10 inches; muck, black (5YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak medium granular structure; many fine roots; about 5 percent woody fragments; slightly acid; gradual wavy boundary.

Oa2—10 to 40 inches; muck, black (5YR 2/1) broken face and rubbed; about 50 percent fiber, 10 percent rubbed; massive; few fine roots; about 15 percent woody fragments; slightly acid; diffuse wavy boundary.

Oa3—40 to 60 inches; muck, black (5YR 2/1) broken face and rubbed; about 30 percent fiber, 5 percent

rubbed; massive; about 15 percent woody fragments; slightly acid.

The organic material is more than 51 inches thick. The content of woody fragments is as much as 30 percent, by volume, throughout the profile.

The organic material has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. Some pedons have as much as 4 inches of fibric material on the surface. The surface tier generally is sapric material, but in some areas it is hemic material. The subsurface and bottom tiers are dominantly sapric material but have as much as 10 inches of hemic material.

Manitowish Series

The Manitowish series consists of very deep, moderately well drained soils on stream terraces and outwash plains. These soils formed in loamy and sandy glacial outwash deposits. Permeability is moderate in the loamy upper part, moderately rapid in the sandy part, and rapid in the substratum. Slopes range from 0 to 3 percent.

Typical profile of Manitowish fine sandy loam, 0 to 3 percent slopes, 1,200 feet east and 30 feet south of the northwest corner of sec. 5, T. 45 N., R. 32 W.

A—0 to 1 inch; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common roots; very strongly acid; abrupt wavy boundary.

E—1 to 4 inches; brown (7.5YR 4/2) fine sandy loam; weak fine subangular blocky structure; friable; common roots; very strongly acid; abrupt wavy boundary.

Bs1—4 to 13 inches; dark brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common roots; strongly acid; gradual wavy boundary.

Bs2—13 to 19 inches; dark brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; few roots; strongly acid; clear wavy boundary.

2BC—19 to 26 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; weak fine subangular blocky structure; very friable; few roots; about 20 percent gravel; strongly acid; clear wavy boundary.

2C—26 to 60 inches; yellowish brown (10YR 5/4), stratified gravelly sand (60 percent) and sand (40 percent); common coarse prominent strong brown (7.5YR 5/6) mottles between depths of 30 and 60 inches; single grain; loose; few roots; about 30 percent gravel in the strata of gravelly sand; moderately acid.

The thickness of the solum ranges from 18 to 28 inches. The loamy upper part of the solum is 10 to 20 inches thick. The content of gravel ranges from 0 to 10 percent in the A, E, and Bs horizons and from 0 to 35 percent in the 2BC and 2C horizons. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2. The A and E horizons are fine sandy loam.

The Bs horizon has hue of 7.5YR and value of 3 or 4. It is fine sandy loam or sandy loam. The 2BC horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loamy sand or gravelly loamy sand.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is typically stratified coarse sand, sand, and the gravelly analogs of those textures.

Merwin Series

The Merwin series consists of very deep, very poorly drained soils on ground moraines and outwash plains. These soils formed in moderately decomposed herbaceous material overlying loamy glacial till and outwash. Permeability is rapid in the organic material and moderately slow in the loamy material. Slopes are 0 to 1 percent.

Typical pedon of Merwin peat, in an area of Greenwood and Merwin peats; 2,000 feet west and 2,200 feet north of the southeast corner of sec. 5, T. 41 N., R. 32 W.

Oi—0 to 8 inches; peat, yellowish brown (10YR 5/4) broken face and rubbed; about 100 percent fiber, 90 percent rubbed; massive; primarily live roots and sphagnum moss; extremely acid; clear wavy boundary.

Oe1—8 to 14 inches; mucky peat, dark reddish brown (5YR 3/3) broken face, very dark gray (5YR 3/1) rubbed; about 80 percent fiber, 50 percent rubbed; massive; herbaceous fibers; extremely acid; gradual wavy boundary.

Oe2—14 to 25 inches; mucky peat, dark reddish brown (5YR 2/2) broken face, black (5YR 2/1) rubbed; about 60 percent fiber, 35 percent rubbed; massive; herbaceous fibers; extremely acid; gradual wavy boundary.

Oe3—25 to 36 inches; mucky peat, dark reddish brown (5YR 2/2) broken face, black (5YR 2/1) rubbed; about 50 percent fiber, 20 percent rubbed; massive; herbaceous fibers; extremely acid; abrupt smooth boundary.

Ab—36 to 37 inches; black (5YR 2/1) silt loam;

massive; firm; extremely acid; abrupt wavy boundary.
Cg—37 to 41 inches; very dark grayish brown (10YR 3/2) sandy loam; massive; friable; extremely acid; clear wavy boundary.
C—41 to 60 inches; brown (7.5YR 4/4) sandy loam; many coarse prominent very dark grayish brown (10YR 3/2) mottles; massive; friable; extremely acid.

Depth to the Ab horizon ranges from 16 to 51 inches. Woody fragments are in some pedons.

The Oi layer has hue of 5YR to 10YR, value of 2 to 5, and chroma of 1 to 4. The Oe layer has hue of 5YR to 10YR and value and chroma of 2 or 3. The surface tier is commonly fibric or hemic material derived from sphagnum moss. The subsurface tier is commonly hemic material derived from herbaceous plants.

The Ab and C horizons are sandy loam, loam, silt loam, or the gravelly analogs of those textures. The content of gravel ranges from 0 to 20 percent.

Minocqua Series

The Minocqua series consists of very deep, poorly drained soils on outwash plains and stream terraces. These soils formed in modified loamy eolian deposits overlying sandy glacial outwash. Permeability is moderate in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Minocqua muck, in an area of Minocqua-Channing complex, 0 to 3 percent slopes; 1,850 feet east and 1,440 feet south of the northwest corner of sec. 10, T. 45 N., R. 33 W.

Oa—0 to 4 inches; black (10YR 2/1) muck; weak medium granular structure; friable; many fine roots; about 5 percent cobbles; very strongly acid; abrupt wavy boundary.
A—4 to 6 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common fine and medium roots; about 5 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.
Bg—6 to 25 inches; gray (5Y 5/1) loam; many medium and coarse prominent olive brown (2.5Y 4/4) mottles; weak thick and very thick platy structure; firm; few fine roots; about 8 percent gravel and 3 percent cobbles; strongly acid; clear wavy boundary.
2BCg—25 to 29 inches; grayish brown (2.5Y 5/2) loamy coarse sand; massive; very friable; about 8 percent gravel and 3 percent cobbles; strongly acid; gradual wavy boundary.
2Cg—29 to 60 inches; dark grayish brown (2.5Y 4/2), stratified coarse sand and gravelly coarse sand; single grain; loose; about 30 percent gravel and 5 percent cobbles in the strata of gravelly coarse sand; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent in the A and Bg horizons, from 0 to 40 percent in the 2BCg horizon, and from 0 to 60 percent in the 2Cg horizon. The content of cobbles ranges from 0 to 5 percent throughout the profile.

The Oa horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is silt loam.

The Bg horizon has hue of 5GY to 7.5YR, value of 4 to 6, and chroma of 1 or 2. It is silt loam, loam, sandy loam, or fine sandy loam. The 2BCg horizon has hue of 5Y to 7.5YR, value of 3 to 6, and chroma of 1 or 2. It is sand, loamy sand, loamy coarse sand, or the gravelly or very gravelly analogs of those textures.

The 2Cg horizon has hue of 5Y to 7.5YR, value of 4 to 6, and chroma of 2 to 4. It is typically stratified loamy sand, sand, coarse sand, and the gravelly and very gravelly analogs of those textures.

Monico Series

The Monico series consists of very deep, somewhat poorly drained, moderately permeable soils in areas between drumlins. These soils formed in loamy glacial drift. Slopes range from 0 to 3 percent.

Typical pedon of Monico loam, nearly level, 2,310 feet north and 1,650 feet west of the southeast corner of sec. 36, T. 44 N., R. 37 W.

Oe—0 to 2 inches; partially decomposed organic material; abrupt smooth boundary.
A—2 to 4 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; many fine to coarse roots; about 3 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.
E—4 to 7 inches; dark grayish brown (10YR 4/2) loam; few fine faint gray (10YR 4/1) mottles; weak fine subangular blocky structure; friable; many fine and medium roots; about 3 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.
Bs—7 to 47 inches; dark brown (7.5YR 3/4) sandy loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel and 3 percent cobbles; moderately acid; clear wavy boundary.

C—47 to 60 inches; dark brown (10YR 3/3) gravelly sandy loam; few fine faint dark grayish brown (10YR 4/2) and distinct yellowish brown (10YR 5/1) mottles; massive; firm; few fine roots; about 10 percent gravel and 8 percent cobbles; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 32 to 50 inches. The content of rock fragments ranges from 0 to 35 percent in the solum.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2. The A and E horizons are loam, silt loam, sandy loam, or fine sandy loam.

The Bs horizon has value of 3 to 5 and chroma of 4 to 6. It is sandy loam, fine sandy loam, loam, silt loam, or the gravelly analogs of those textures.

The C horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It has textures similar to those of the Bs horizon.

Net Series

The Net series consists of very deep, somewhat poorly drained soils on ground moraines and end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. They are shallow or moderately deep to a fragipan. Permeability is moderate above the fragipan, very slow in the fragipan, and moderate or moderately rapid in the substratum. Slopes range from 0 to 4 percent.

Typical pedon of Net very fine sandy loam, 0 to 4 percent slopes, very stony, 2,376 feet south and 792 feet east of the northwest corner of sec. 9, T. 46 N., R. 34 W.

A—0 to 3 inches; dark brown (7.5YR 3/2) very fine sandy loam, brown (7.5YR 5/2) dry; weak medium granular structure; friable; many fine roots; about 5 percent gravel and 7 percent cobbles; strongly acid; abrupt smooth boundary.

E—3 to 6 inches; brown (7.5YR 5/2) very fine sandy loam; common medium distinct dark gray (N 4/0) mottles; weak medium subangular blocky structure; friable; many fine roots; about 5 percent gravel and 7 percent cobbles; strongly acid; abrupt wavy boundary.

Bhs—6 to 12 inches; dark brown (7.5YR 3/2) very fine sandy loam; few fine prominent yellowish red (5YR 4/6) and few medium distinct dark gray (N 4/0) mottles; weak fine and medium subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bs1—12 to 21 inches; dark brown (10YR 4/3) very fine sandy loam; many fine prominent yellowish red (5YR 4/6) and many medium distinct brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bs2—21 to 28 inches; dark brown (7.5YR 4/4) fine sandy loam; many medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; about 8 percent gravel and 5 percent cobbles; strongly acid; gradual wavy boundary.

2Ex/Bx—28 to 35 inches; about 70 percent brown (10YR 5/2) gravelly loamy sand (E) surrounding peds of dark brown (7.5YR 4/2) gravelly sandy loam (B); common medium distinct dark gray (N 4/0) and common fine prominent strong brown (7.5YR 5/8) mottles; moderate medium platy structure; very firm; common fine vesicular pores; about 20 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

2Bx/Ex—35 to 49 inches; about 80 percent dark brown (10YR 4/2) gravelly sandy loam (B) surrounded by brown (7.5YR 5/2) gravelly loamy sand (E); few fine prominent strong brown (7.5YR 5/8) and common medium distinct dark gray (N 4/0) mottles; weak medium subangular blocky structure; very firm; common fine vesicular pores; about 20 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

2C—49 to 60 inches; dark brown (7.5YR 4/2) gravelly sandy loam; massive; friable; about 20 percent gravel and 5 percent cobbles; moderately acid.

The thickness of the solum ranges from 30 to 52 inches. The thickness of the eolian material ranges from 16 to 38 inches. Depth to the fragipan ranges from 15 to 30 inches. The content of gravel ranges from 3 to 10 percent in the eolian material and from 15 to 35 percent in the glacial till. The content of cobbles ranges from 1 to 10 percent throughout the profile. The content of stones on the surface ranges from 0.01 to 3.0 percent.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are very fine sandy loam or silt loam.

The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3. The Bs horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. The Bhs and Bs horizons are very fine sandy loam, silt loam, or fine sandy loam. The Ex part of the Ex/Bx and Bx/Ex

horizons has hue of 7.5YR or 10YR, value of 5, and chroma of 2 or 3. The Bx part has hue of 7.5YR or 10YR, value of 4, and chroma of 2 to 4. The Ex/Bx and Bx/Ex horizons are sandy loam, loamy sand, or the gravelly analogs of those textures or very fine sandy loam or silt loam.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is gravelly sandy loam or gravelly loamy sand.

Oconto Series

The Oconto series consists of very deep, well drained soils on outwash plains. These soils formed in modified loamy eolian deposits overlying sandy glacial outwash. Permeability is moderate in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 1 to 18 percent.

Typical pedon of Oconto very fine sandy loam, 1 to 2 percent slopes, 2,350 feet south and 1,650 feet west of the northeast corner of sec. 35, T. 43 N., R. 31 W.

Ap—0 to 7 inches; dark brown (7.5YR 3/2) very fine sandy loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine roots; about 2 percent gravel and 1 percent cobbles; slightly acid; clear wavy boundary.

E—7 to 11 inches; brown (7.5YR 5/2) very fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; friable; many fine roots; about 2 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

Bs1—11 to 18 inches; strong brown (7.5YR 4/6) very fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; friable; common fine and medium roots; about 2 percent gravel and 1 percent cobbles; moderately acid; gradual wavy boundary.

Bs2—18 to 28 inches; dark brown (7.5YR 4/4) very fine sandy loam; weak medium subangular blocky structure; firm; common fine and medium roots; about 2 percent gravel and 1 percent cobbles; moderately acid; clear wavy boundary.

2Bt—28 to 35 inches; dark brown (7.5YR 3/4) gravelly loam; weak medium subangular blocky structure; friable; many fine and medium roots; many reddish brown (5YR 4/4) clay films occurring as bridges between sand grains and in pebble casings; about 20 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

2C—35 to 60 inches; strong brown (7.5YR 5/6) very gravelly coarse sand that has a few thin strata of sand; single grain; loose; few fine roots; about 45 percent gravel and 5 percent cobbles; strong effervescence; slightly alkaline.

The thickness of the solum ranges from 30 to 40 inches. The content of gravel ranges from 0 to 5 percent in the upper part of the solum, from 10 to 25 percent in the Bt horizon, and from 35 to 60 percent in the 2C horizon. The content of cobbles ranges from 0 to 10 percent throughout the profile.

In areas that have not been cultivated, the A horizon is 1 to 3 inches thick. It has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. The Ap, A, and E horizons are very fine sandy loam or fine sandy loam.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It very fine sandy loam or fine sandy loam. The Bt horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is loam, sandy loam, or the gravelly analogs of those textures.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6.

Ocqueoc Series

The Ocqueoc series consists of very deep, well drained soils on outwash plains. These soils formed in sandy glacial outwash deposits overlying loamy ice-contact sediments. Permeability is rapid in the upper part of the profile and moderately slow in the lower part. Slopes range from 1 to 18 percent.

Typical pedon of Ocqueoc loamy fine sand, 6 to 18 percent slopes, 1,840 feet east and 510 feet north of the southwest corner of sec. 12, T. 41 N., R. 31 W.

A—0 to 3 inches; dark reddish brown (5YR 2/2) loamy fine sand, reddish gray (5YR 5/2) dry; weak fine granular structure; very friable; common fine and medium roots; about 1 percent gravel and 1 percent cobbles; very strongly acid; abrupt wavy boundary.

E—3 to 5 inches; dark reddish gray (5YR 4/2) loamy fine sand; weak very fine subangular blocky structure; very friable; common fine and medium roots; about 1 percent gravel and 1 percent cobbles; very strongly acid; abrupt broken boundary.

Bhs—5 to 7 inches; dark reddish brown (5YR 3/3) loamy fine sand; weak fine subangular blocky structure; very friable; common fine and medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Bs1—7 to 17 inches; dark reddish brown (5YR 3/4) loamy fine sand; weak fine subangular blocky structure; very friable; common fine and medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Bs2—17 to 23 inches; reddish brown (5YR 4/4) loamy fine sand; weak medium subangular blocky

structure; very friable; few fine and medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2C1—23 to 40 inches; 75 percent reddish brown (5YR 4/4) very fine sand; 20 percent bands of reddish brown (5YR 3/3) very fine sandy loam that are ¼ to ¾ inch thick; massive; 70 percent very friable and friable and 30 percent weakly cemented; few fine and medium roots; moderately acid; gradual wavy boundary.

2C2—40 to 60 inches; 80 percent reddish brown (5YR 5/4) very fine sand; 20 percent bands of reddish brown (2.5YR 4/4) very fine sandy loam that are ⅓ to ½ inch thick; massive; very friable and friable; few fine roots; moderately acid.

The thickness of the solum ranges from 15 to 30 inches. Depth to the loamy 2C horizon ranges from 20 to 39 inches. The content of gravel ranges from 0 to 2 percent in the sandy material. The content of cobbles ranges from 0 to 4 percent in the sandy material.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. The A and E horizons are loamy fine sand.

The Bhs horizon has hue of 5YR or 7.5YR, value of 3, and chroma of 2 or 3. The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. These horizons are loamy fine sand or fine sand.

The 2C horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 6. Some pedons have strata of fine sand or loamy fine sand.

Padus Series

The Padus series consists of very deep, well drained soils on outwash plains, stream terraces, and eskers. These soils formed in loamy glacial outwash deposits overlying sandy glacial outwash. Permeability is moderate or moderately rapid in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 1 to 35 percent.

Typical pedon of Padus fine sandy loam, 1 to 2 percent slopes, 800 feet south and 50 feet east of the northwest corner of sec. 22, T. 42 N., R. 33 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; about 5 percent gravel and 2 percent cobbles; strongly acid; abrupt smooth boundary.

Bs1—7 to 17 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.

Bs2—17 to 25 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 10 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

2B/E—25 to 35 inches; about 80 percent reddish brown (5YR 4/4) gravelly fine sandy loam (Bt) surrounded by brown (7.5YR 5/4) fine sandy loam (E); weak medium subangular blocky structure; friable; few fine and medium roots; few clay films in pebble casings and pores; about 20 percent gravel; strongly acid; clear wavy boundary.

2Bt—35 to 39 inches; reddish brown (5YR 4/4) gravelly fine sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; common clay films in pebble casings and on faces of peds; about 20 percent gravel; strongly acid; abrupt wavy boundary.

2C—39 to 60 inches; brown (7.5YR 4/4) gravelly coarse sand; single grain; loose; about 25 percent gravel; moderately acid.

The thickness of the solum ranges from 24 to 40 inches. The depth to sand or gravelly sand is less than 40 inches. The content of gravel ranges from 0 to 12 percent in the upper part of the solum and from 15 to 40 percent in the lower part of the solum and in the substratum. The content of cobbles ranges from 0 to 5 percent throughout the profile. The content of stones on the surface ranges from less than 0.01 to 0.1 percent.

Areas that have not been cultivated have an A and an E horizon. The A horizon is 1 to 3 inches thick. It has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The Ap, A, and E horizons are fine sandy loam.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 or 5. Some pedons have a thin Bhs horizon. This horizon has value and chroma of 2 or 3. The Bs and Bhs horizons are fine sandy loam. The E part of the 2B/E horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. The B part of the 2B/E horizon and the 2Bt horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4. The 2B/E and 2Bt horizons are fine sandy loam, sandy loam, loam, or the gravelly or very gravelly analogs of those textures.

The 2C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. It commonly is stratified sand, coarse sand, and the gravelly and very gravelly analogs of those textures.

Peavy Series

The Peavy series consists of well drained and moderately well drained soils on ground moraines. These soils are moderately deep or deep over dense basal till. They formed in modified loamy eolian material and in the underlying loamy, dense glacial till. Permeability is moderate in the upper part of the profile and very slow in the lower part. Slopes range from 1 to 18 percent.

Typical pedon of Peavy silt loam, 1 to 6 percent slopes, stony, 780 feet south and 390 feet west of the northeast corner of sec. 36, T. 43 N., R. 33 W.

Ap—0 to 6 inches; dark reddish brown (5YR 3/2) silt loam, reddish brown (5YR 4/3) dry; weak fine granular structure; friable; many fine roots; about 3 percent channers and 2 percent flagstones; moderately acid; abrupt wavy boundary.

Bs—6 to 22 inches; dark reddish brown (2.5YR 3/4) very fine sandy loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 3 percent gravel and 2 percent flagstones; moderately acid; abrupt broken boundary.

E—22 to 27 inches; reddish brown (5YR 4/4) fine sandy loam; few fine distinct yellowish red (5YR 4/6) mottles; weak fine subangular blocky structure; friable; few fine roots; about 3 percent channers and 2 percent flagstones; moderately acid; abrupt wavy boundary.

2Btd—27 to 41 inches; dark reddish brown (2.5YR 3/4) channery loam; moderate thin platy structure; very firm; many red (2.5YR 4/6) clay films on faces of peds; about 20 percent channers and 10 percent flagstones; moderately acid; clear wavy boundary.

2Cd—41 to 70 inches; dark reddish brown (5YR 3/3) channery sandy loam; weak medium platy structure; extremely firm; about 20 percent channers and 10 percent flagstones; slightly acid.

The thickness of the solum ranges from 26 to 50 inches. The depth to dense till ranges from 20 to 42 inches. The content of channers ranges from 2 to 10 percent in the Ap, Bs, and E horizons; from 2 to 20 percent in the 2Btd horizon; and from 15 to 50 percent in the dense till. The content of flagstones ranges from 1 to 5 percent in the upper part of the profile and from 5 to 10 percent in the dense till. The content of stones on the surface ranges from 0.01 to 0.1 percent.

The Ap horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3. In areas that have not been cultivated, the A horizon is 1 to 3 inches thick. It has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an E horizon directly below the Ap or A horizon. This horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The Ap horizon and the A and E horizons, if they occur, are silt loam or very fine sandy loam.

The Bs horizon has hue of 2.5YR to 7.5YR, value of 3 or 4, and chroma of 3 to 6. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Bs and E horizons are very fine sandy loam, silt loam, loam, or fine sandy loam. The 2Btd horizon has hue of 2.5YR or 5YR and value and chroma of 3 or 4. It is channery loam or very channery loam.

The 2Cd horizon has colors similar to those of the 2Btd horizon. It is channery loam, very channery loam, channery sandy loam, or very channery sandy loam.

Pence Series

The Pence series consists of very deep, well drained soils on outwash plains, stream terraces, and eskers. These soils formed in loamy and sandy glacial outwash deposits. Permeability is moderately rapid in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 0 to 35 percent.

Typical pedon of Pence fine sandy loam, 6 to 18 percent slopes, 900 feet east of the northwest corner of sec. 1, T. 44 N., R. 31 W.

Oe—0 to 1 inch; black (10YR 2/1), partially decomposed forest litter; weak very fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

E—1 to 4 inches; light brownish gray (10YR 6/2) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; strongly acid; clear wavy boundary.

Bs1—4 to 13 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; many fine and medium roots; strongly acid; clear wavy boundary.

Bs2—13 to 20 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; about 10 percent gravel; strongly acid; gradual wavy boundary.

2BC—20 to 33 inches; strong brown (7.5YR 4/6) gravelly sand; single grain; loose; few fine roots; about 30 percent gravel; strongly acid; clear wavy boundary.

2C—33 to 60 inches; dark yellowish brown (10YR 4/4), stratified gravelly coarse sand and sand; single grain; loose; about 20 percent gravel in the strata of gravelly coarse sand; strongly acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 20 to 36 inches. The loamy deposit is 10 to 20 inches thick.

The content of gravel ranges from 0 to 15 percent in the A, E, and Bs horizons and from 15 to 35 percent in the 2BC and 2C horizons. The content of cobbles ranges from 0 to 5 percent throughout the profile.

Some pedons have an A horizon. This horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2. The A and E horizons are fine sandy loam or loamy sand.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It is fine sandy loam, sandy loam, or the gravelly analogs of those textures. The 2BC horizon has hue of 5YR or 7.5YR and value and chroma of 4 to 6. It is sand, coarse sand, loamy sand, or the gravelly analogs of those textures.

The 2C horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. It is typically stratified coarse sand, sand, and the gravelly analogs of those textures. Some pedons have layers of very gravelly sand and very gravelly coarse sand. In some places the water table is at a depth of 6 to 10 feet.

Petticoat Series

The Petticoat series consists of very deep, moderately well drained and well drained soils on ground moraines. These soils formed in modified loamy eolian deposits overlying sandy glacial till. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 1 to 18 percent.

Typical pedon of Petticoat silt loam, in an area of Petticoat-Wabeno silt loams, 1 to 6 percent slopes, very stony; 1,500 feet east and 560 feet north of the southwest corner of sec. 20, T. 46 N., R. 32 W.

A—0 to 1 inch; black (5YR 2/1) silt loam, dark reddish gray (5YR 4/2) dry; weak medium granular structure; friable; many fine roots; about 10 percent cobbles and 2 percent gravel; very strongly acid; abrupt wavy boundary.

E—1 to 4 inches; reddish gray (5YR 5/2) silt loam; weak fine subangular blocky structure; friable; many fine roots; about 10 percent cobbles and 2 percent gravel; very strongly acid; abrupt wavy boundary.

Bhs—4 to 8 inches; dark reddish brown (5YR 3/2) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 10 percent cobbles and 2 percent gravel; very strongly acid; clear wavy boundary.

Bs1—8 to 14 inches; dark reddish brown (5YR 3/4) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; clear wavy boundary.

Bs2—14 to 20 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; clear wavy boundary.

E'—20 to 30 inches; brown (10YR 5/3) silt loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium platy structure; friable; few fine and medium roots; about 5 percent cobbles and 5 percent gravel; very strongly acid; gradual wavy boundary.

Bt—30 to 38 inches; dark brown (7.5YR 4/4) loam; common fine prominent grayish brown (10YR 5/2) and common medium prominent yellowish red (5YR 4/8) mottles; weak medium platy structure; firm; few fine roots; many dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent cobbles and 5 percent gravel; strongly acid; abrupt wavy boundary.

2C—38 to 60 inches; brown (10YR 5/3) gravelly loamy sand; common medium prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/8) mottles; massive; very friable; few fine roots; about 20 percent gravel and 5 percent cobbles; strongly acid.

The thickness of the solum ranges from 25 to 40 inches. The content of gravel ranges from 1 to 10 percent in the solum and from 15 to 30 percent in the C horizon. The content of cobbles ranges from 10 to 20 percent in the upper part of the solum and from 5 to 10 percent in the lower part of the solum and in the C horizon. The content of stones on the surface ranges from 0.1 to 3.0 percent.

The A horizon has hue of 5YR or 7.5YR and value and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2. The A and E horizons are silt loam or very fine sandy loam.

The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3. The Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. The E′ horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The E′ and Bt horizons are fine sandy loam, silt loam, or loam.

The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is gravelly loamy sand or gravelly loamy fine sand.

Sagola Series

The Sagola series consists of very deep, well drained, moderately rapidly permeable soils on ground moraines and end moraines. These soils formed in loamy glacial till. Slopes range from 1 to 35 percent.

Typical pedon of Sagola fine sandy loam, 6 to 18 percent slopes, stony, 3,600 feet south and 1,450 feet west of the northeast corner of sec. 36, T. 42 N., R. 31 W.

A—0 to 1 inch; black (5YR 2/1) fine sandy loam, very dark gray (5YR 3/1) dry; weak fine granular structure; friable; many fine roots; about 3 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

E—1 to 7 inches; reddish gray (5YR 5/2) fine sandy loam; weak fine subangular blocky structure; friable; common fine roots; about 3 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

Bs—7 to 18 inches; reddish brown (5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 3 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

E/B—18 to 30 inches; about 80 percent brown (10YR 5/3) fine sandy loam (E) surrounding peds of dark brown (7.5YR 4/4) fine sandy loam (Bt); weak medium subangular blocky structure; friable; few clay films on faces of peds; few medium roots; about 3 percent gravel and 2 percent cobbles; moderately acid; clear wavy boundary.

B/E—30 to 47 inches; about 60 percent dark reddish brown (5YR 3/4) fine sandy loam (Bt); many clay films on faces of peds; surrounded by reddish brown (5YR 5/3) loamy fine sand (E); weak thick platy structure; firm; few medium roots; about 3 percent gravel and 2 percent cobbles; neutral; abrupt wavy boundary.

2C—47 to 60 inches; reddish brown (5YR 5/4) loamy fine sand; weak fine subangular blocky structure; very friable; few medium roots; about 10 percent gravel; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The content of gravel ranges from 1 to 10 percent. The content of cobbles also ranges from 1 to 10 percent. The content of stones on the surface ranges from 0 to 3 percent.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are fine sandy loam or loamy fine sand.

The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is fine sandy loam or loamy fine sand. The E part of the E/B and B/E horizons has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. It is loamy sand, loamy fine sand, or fine sandy loam. The Bt part has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is sandy loam or fine sandy loam. Some pedons have an E and Bt horizon underlying the B/E horizon. This horizon has colors and textures similar to those of the E/B and B/E horizons.

The C horizon is sandy loam, loamy fine sand, or loamy sand. It is calcareous in some pedons.

Sarona Series

The Sarona series consists of very deep, well drained, moderately permeable soils on ground moraines and end moraines. These soils formed in loamy glacial till. Slopes range from 1 to 35 percent.

Typical pedon of Sarona fine sandy loam, 1 to 6 percent slopes, stony, 575 feet east and 1,800 feet south of the northwest corner of sec. 14, T. 42 N., R. 33 W.

A—0 to 2 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine roots; about 5 percent gravel; moderately acid; abrupt smooth boundary.

E—2 to 7 inches; brown (7.5YR 5/2) fine sandy loam; weak thin platy structure; friable; many fine and medium roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Bs—7 to 18 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel; moderately acid; clear wavy boundary.

E/B—18 to 33 inches; about 70 percent brown (7.5YR 5/4) loamy fine sand (E) surrounding peds of dark brown (7.5YR 4/4) fine sandy loam (Bt); moderate thick platy structure; friable; common fine and medium roots; few fine vesicular pores; few reddish brown (5YR 5/4) clay films in gravel casings and pores; about 8 percent gravel; strongly acid; clear wavy boundary.

Bt—33 to 37 inches; dark brown (7.5YR 4/4) loam; moderate thick platy structure; friable; few fine and medium roots; few fine vesicular pores; few reddish brown (5YR 5/4) clay films in pebble casings and pores; about 8 percent gravel; strongly acid; clear wavy boundary.

C—37 to 60 inches; reddish brown (5YR 4/4) gravelly sandy loam; massive; firm; about 25 percent gravel; strongly acid.

The thickness of the solum ranges from 30 to 60 inches. The content of gravel ranges from 0 to 12 percent in the upper part of the solum and from 5 to 25 percent in the lower part of the solum and in the C horizon. The content of cobbles ranges from 0 to 5 percent throughout the profile. The content of stones on

the surface ranges from 0.01 to 0.1 percent.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are fine sandy loam or loamy sand.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. The E part of the E/B horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 2 to 4. It is loamy fine sand, loamy sand, fine sandy loam, or sandy loam. The Bt part of the E/B horizon has hue of 7.5YR or 5YR, value of 4, and chroma of 4 to 6. It is fine sandy loam, loam, or sandy loam. The Bt horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. It is loam, sandy loam, or the gravelly analogs of those textures.

The C horizon has hue of 7.5YR or 5YR and value and chroma of 4 to 6. It is sandy loam, loamy sand, or the gravelly analogs of those textures.

Solona Series

The Solona series consists of very deep, somewhat poorly drained, moderately permeable soils on ground moraines. These soils formed in loamy glacial till. Slopes range from 0 to 3 percent.

Typical pedon of Solona very fine sandy loam, 0 to 3 percent slopes, stony, 1,240 feet west and 2,640 feet south of the northeast corner of sec. 36, T. 43 N., R. 31 W.

A—0 to 6 inches; black (5YR 2/1) very fine sandy loam, dark gray (5YR 4/1) dry; weak fine granular structure; friable; many fine roots; about 10 percent cobbles; neutral; clear wavy boundary.

E—6 to 12 inches; brown (7.5YR 5/2) very fine sandy loam; many fine prominent yellowish red (5YR 4/6) mottles; moderate thin platy structure; firm; common fine and medium roots; few fine vesicular pores; about 10 percent cobbles; neutral; clear wavy boundary.

Bw—12 to 30 inches; brown (7.5YR 5/4) very fine sandy loam; many medium prominent yellowish red (5YR 5/8) and common fine prominent reddish gray (5YR 5/2) mottles; moderate medium subangular blocky structure; friable; common fine and medium roots; neutral; clear wavy boundary.

B/E— 30 to 36 inches; about 90 percent yellowish red (5YR 4/6) loam (Bt); many yellowish red (5YR 5/6) clay films in gravel casings and pores; surrounded by brown (7.5YR 5/3) loamy sand (E); weak coarse subangular blocky structure; friable; few fine and medium roots; about 5 percent gravel; neutral; gradual wavy boundary.

C—36 to 60 inches; yellowish red (5YR 4/6) sandy loam; massive; friable; about 5 percent gravel; slight effervescence; slightly alkaline.

The thickness of the solum ranges from 30 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile. The content of cobbles also ranges from 0 to 10 percent.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are very fine sandy loam or fine sandy loam.

The Bw horizon and the Bt part of the B/E horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. They are very fine sandy loam, fine sandy loam, or loam. The E part of the B/E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3. It is sandy loam or loamy sand.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or fine sandy loam. Thin strata of sand, gravelly sand, very fine sand, or silt loam are common below a depth of 40 inches.

Soperton Series

The Soperton series consists of very deep, well drained soils on end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. They are moderately deep to a fragipan. Permeability is moderate above the fragipan, moderately slow in the fragipan, and moderate or moderately rapid below the fragipan. Slopes range from 18 to 35 percent.

Typical pedon of Soperton silt loam, 18 to 35 percent slopes, very stony, 2,000 feet east of the northwest corner of sec. 19, T. 43 N., R. 33 W.

A—0 to 1 inch; very dark gray (5YR 3/1) silt loam, dark gray (5YR 4/1) dry; weak fine granular structure; friable; many fine roots; about 2 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

E—1 to 5 inches; brown (7.5YR 4/2) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 2 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.

Bs—5 to 16 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

B/E—16 to 25 inches; about 85 percent dark brown (7.5YR 4/4) silt loam (Bt) surrounded by brown (10YR 5/3) silt loam (E) on faces of peds; weak

medium subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel and 2 percent cobbles; strongly acid; clear irregular boundary.

2Btx/Ex—25 to 32 inches; about 85 percent dark brown (7.5YR 4/4) loam (Btx); few distinct reddish brown (5YR 4/4) clay films on faces of peds; surrounded by brown (10YR 5/3) loam (Ex) on faces of peds and as intrusions; weak thin platy structure; very firm; about 5 percent gravel and 2 percent cobbles; moderately acid; clear irregular boundary.

2Btx—32 to 41 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium platy structure; very firm; common distinct reddish brown (5YR 5/4) clay films on faces of peds; about 8 percent gravel and 3 percent cobbles; moderately acid; gradual wavy boundary.

2C—41 to 60 inches; 70 percent brown (7.5YR 5/4) sandy loam; 30 percent pockets and strata of gravelly loamy sand; massive; friable; about 10 percent gravel and 2 percent cobbles; moderately acid.

The thickness of the solum ranges from 40 to 50 inches. The thickness of the eolian material ranges from 15 to 36 inches. Depth to the fragipan ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent in the eolian material and from 5 to 25 percent in the glacial till. The content of cobbles ranges from 0 to 10 percent in the eolian material and from 1 to 20 percent in the glacial till.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are silt loam.

The Bs horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. The B part of the B/E and Btx/Ex horizons has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 4 to 6. The E part has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 or 3. The Bs and B/E horizons are silt loam. The 2Btx/Ex horizon is loam. The 2Btx horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6. It is sandy loam, loam, or the gravelly or cobbly analogs of those textures. In some pedons it has strata of loamy sand or gravelly loamy sand.

The 2C horizon has colors similar to those of the 2Btx horizon. It is sandy loam, loamy sand, or the gravelly or cobbly analogs of those textures.

Stambaugh Series

The Stambaugh series consists of very deep, well drained and moderately well drained soils on outwash plains and stream terraces. These soils formed in modified loamy eolian deposits overlying sandy glacial outwash. Permeability is moderately slow in the solum and rapid in the substratum. Slopes range from 1 to 18 percent.

Typical pedon of Stambaugh silt loam, 1 to 2 percent slopes, stony, 900 feet north and 700 feet west of the center of sec. 13, T. 42 N., R. 34 W.

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; about 2 percent gravel; moderately acid; abrupt smooth boundary.

Bs1—4 to 10 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 1 percent gravel; common very dark gray (10YR 3/1) wormcasts; moderately acid; clear wavy boundary.

Bs2—10 to 18 inches; brown (7.5YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; very few dark gray (10YR 3/1) wormcasts in the upper 3 inches; moderately acid; clear wavy boundary.

E—18 to 22 inches; yellowish brown (10YR 5/4) very fine sandy loam; very weak medium platy structure; friable; few fine and medium roots; common very fine pores; very thin coatings of light yellowish brown (10YR 6/4) very fine sand between plates; moderately acid; abrupt irregular boundary.

B/E—22 to 39 inches; about 70 percent reddish brown (5YR 4/4) silt loam (Bt); few reddish brown (5YR 5/4) clay films in pores; brown (7.5YR 5/4) silt loam (E) surrounding the Bt material; common fine distinct strong brown (7.5YR 5/6) mottles; weak thick platy structure parting to moderate fine angular blocky; firm; few fine roots; common fine pores; about 2 percent gravel; moderately acid; abrupt smooth boundary.

2C1—39 to 50 inches; dark brown (7.5YR 4/4) very gravelly sand; single grain; loose; few fine roots; about 35 percent gravel; moderately acid; abrupt smooth boundary.

2C2—50 to 60 inches; reddish brown (5YR 4/4) gravelly sand; single grain; loose; about 25 percent gravel and 5 percent cobbles; moderately acid.

The thickness of the solum ranges from 24 to 40 inches. The content of gravel ranges from 0 to 5 percent in the solum and from 25 to 60 percent in the 2C horizon. The content of cobbles ranges from 0 to 5 percent in the solum and from 0 to 10 percent in the 2C horizon. The content of stones on the surface ranges from 0.01 to 0.1 percent.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1. Some pedons have an E horizon

directly below the A horizon. This horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. The A horizon and the E horizon, if it occurs, are silt loam or very fine sandy loam.

The Bs horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. The E horizon and the E part of the B/E horizon have hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. The B part of the B/E horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4. The Bs, E, and B/E horizons are silt loam or very fine sandy loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is gravelly sand or very gravelly sand.

Sundog Series

The Sundog series consists of very deep, well drained and moderately well drained soils on outwash plains and eskers, in crevasse fillings, and on stream terraces and moraines. These soils formed in modified loamy eolian deposits overlying sandy glacial outwash and till. Permeability is moderate in the upper part of the profile and rapid or very rapid in the lower part. Slopes range from 1 to 50 percent.

Typical pedon of Sundog very fine sandy loam, 1 to 6 percent slopes, 1,550 feet south and 200 feet east of the northwest corner of sec. 11, T. 45 N., R. 33 W.

A—0 to 4 inches; dark brown (7.5YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; about 5 percent gravel and 5 percent cobbles; moderately acid; abrupt smooth boundary.

E—4 to 6 inches; gray (5YR 5/1) very fine sandy loam; weak fine subangular blocky structure; friable; few fine and medium roots; about 5 percent gravel and 5 percent cobbles; moderately acid; abrupt wavy boundary.

Bs1—6 to 9 inches; dark reddish brown (5YR 3/4) very fine sandy loam; weak medium subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bs2—9 to 15 inches; dark brown (7.5YR 4/4) very fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

BC—15 to 22 inches; brown (7.5YR 5/4) gravelly very fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots; about 20 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

2C1—22 to 43 inches; brown (7.5YR 5/4) sand that has bands of loamy sand; single grain; loose; few fine roots; about 5 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

2C2—43 to 60 inches; brown (7.5YR 5/4) very gravelly coarse sand that has pockets of very fine sandy loam; single grain; loose; about 50 percent gravel and 5 percent cobbles; moderately acid.

The thickness of the solum ranges from 15 to 30 inches. The content of gravel ranges from 0 to 15 percent in the A and E horizons, from 0 to 8 percent in the Bs horizon, from 15 to 35 percent in the BC horizon, and from 0 to 60 percent in the 2C horizon. The content of cobbles ranges from 0 to 35 percent throughout the profile. The content of stones on the surface ranges from 0.01 to 0.1 percent.

Some pedons have an O horizon. This horizon has hue of 5YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The A horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 1 or 2. The A and E horizons are silt loam, very fine sandy loam, fine sandy loam, or the gravelly or cobbly analogs of those textures.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4. It is silt loam, loam, very fine sandy loam, or fine sandy loam. The BC horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. It is gravelly very fine sandy loam or gravelly fine sandy loam.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is sand, coarse sand, or the gravelly, very gravelly, or cobbly analogs of those textures. Thin strata and pockets of loamy sand, very fine sand, and very fine sandy loam are common.

Trenary Series

The Trenary series consists of very deep, well drained, moderately permeable soils on ground moraines and end moraines. These soils formed in loamy glacial till. Slopes range from 1 to 18 percent.

Typical pedon of Trenary fine sandy loam, 1 to 6 percent slopes, stony, 1,850 feet west and 2,475 feet south of the northeast corner of sec. 36, T. 43 N., R. 31 W.

A—0 to 4 inches; black (5YR 2/1) fine sandy loam, dark gray (5YR 4/1) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt wavy boundary.

E—4 to 5 inches; brown (7.5YR 4/2) fine sandy loam; weak medium subangular blocky structure; friable; many fine and medium roots; slightly acid; abrupt broken boundary.

Bs—5 to 12 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; neutral; clear wavy boundary.

Btx/Ex—12 to 23 inches; about 80 percent dark reddish brown (5YR 3/4) sandy loam (Btx); about 20 percent reddish brown (5YR 5/3) loamy sand (E) on faces of peds; weak coarse subangular blocky structure; firm; common fine and medium roots; few fine vesicular pores; few reddish brown (5YR 4/4) clay films in pebble casings and pores; about 5 percent gravel; neutral; gradual wavy boundary.

B/E—23 to 36 inches; about 80 percent dark reddish brown (2.5YR 3/4) loam (Bt); about 20 percent reddish brown (5YR 5/3) loamy sand (E) on faces of peds; weak coarse subangular blocky structure; friable; common fine and medium roots; few fine vesicular pores; many reddish brown (5YR 4/4) clay films in pebble casings and pores; about 5 percent gravel; neutral; gradual wavy boundary.

C—36 to 60 inches; reddish brown (5YR 4/4) sandy loam; massive; friable; few fine roots; about 5 percent gravel; slight effervescence; slightly alkaline.

The thickness of the solum ranges from 30 to 42 inches. The content of gravel ranges from 0 to 10 percent throughout the profile. The content of cobbles ranges from 0 to 5 percent. The content of stones on the surface ranges from 0.01 to 0.1 percent.

The A horizon has hue of 5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The E horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 1 or 2. The A and E horizons are fine sandy loam or very fine sandy loam.

The Bs horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 or 5. It is fine sandy loam or very fine sandy loam. The Bt part of the B/E horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 or 5. It is sandy loam or loam. The E part has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is sandy loam or loamy sand. The B/E horizon does not meet fragipan requirements, but it commonly has characteristics associated with fragipans, such as platy structure, vesicles, and slight brittleness.

The C horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It is generally sandy loam, but thin layers of sand and gravelly sand are common.

Typic Dystrochrepts, Coarse-Loamy

These soils are coarse-loamy, mixed, frigid Typic Dystrochrepts. They are very deep, moderately well drained and well drained soils on ground moraines, outwash plains, stream terraces, and alluvial fans at the base of drumlins, eskers, and beach ridges. Permeability is moderate or is moderate in the upper part and rapid in the lower part. Slopes range from 0 to 35 percent.

Reference pedon of Typic Dystrochrepts, coarse-loamy, 330 feet south and 400 feet east of the center of sec. 19, T. 43 N., R. 36 W.

Oa—0 to 3 inches; black (5YR 2/1), decomposed organic material; weak fine granular structure; friable; many fine roots; extremely acid; abrupt smooth boundary.

A—3 to 5 inches; dark brown (7.5YR 3/2) silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; about 3 percent cobbles and 2 percent gravel; strongly acid; clear smooth boundary.

Bw1—5 to 12 inches; dark yellowish brown (10YR 4/4) cobbly silt loam; moderate medium subangular blocky structure; friable; common fine and few medium and coarse roots; about 10 percent cobbles and 5 percent gravel; strongly acid; clear wavy boundary.

Bw2—12 to 28 inches; dark brown (7.5YR 4/4) cobbly silt loam; many medium faint strong brown (7.5YR 5/6) and distinct strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; common fine and few medium and coarse roots; about 10 percent cobbles and 5 percent gravel; strongly acid; clear smooth boundary.

Bw3—28 to 51 inches; dark yellowish brown (10YR 4/4) cobbly silt loam; common medium distinct strong brown and prominent strong brown (7.5YR 5/8) mottles; strong coarse subangular blocky structure; firm; few fine roots; about 10 percent cobbles and 5 percent gravel; strongly acid; clear smooth boundary.

BC—51 to 63 inches; dark yellowish brown (10YR 4/4) silt loam; many medium distinct brown (7.5YR 5/2) and prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; firm; few fine roots; about 5 percent cobbles and 2 percent gravel; strongly acid; gradual wavy boundary.

2C—63 to 72 inches; dark brown (10YR 4/3) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; about 5 percent cobbles and 2 percent gravel; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 28 to 64 inches. The content of rock fragments ranges from 0 to 20 percent in the solum and from 5 to 30 percent in the substratum.

The O horizon consists of undecomposed to

decomposed conifer and hardwood litter.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an E horizon. This horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A and E horizons are silt loam, fine sandy loam, sandy loam, or loam.

The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 3 to 5. It is silt loam, loam, fine sandy loam, sandy loam, loam, or the gravelly or cobbly analogs of those textures.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It has textures similar to those of the Bw horizon. Some pedons have sandy or gravelly material at a depth of 40 to 60 inches.

Typic Fragiaquods, Coarse-Loamy

These soils are coarse-loamy, mixed, frigid Typic Fragiaquods. They are very deep, somewhat poorly drained soils on ground moraines. The soils formed in modified loamy eolian material and in the underlying loamy or sandy glacial till. They are shallow to a fragipan. Permeability is moderate above and below the fragipan and very slow in the fragipan. Slopes range from 0 to 3 percent.

Reference pedon of Typic Fragiaquods, coarse-loamy, nearly level, 1,370 feet south and 1,470 feet west of the northeast corner of sec. 8, T. 44 N., R. 36 W.; in Iron River Township:

Oa—0 to 2 inches; black (10YR 2/1), well decomposed organic material; weak fine granular structure; friable; many fine roots; extremely acid; abrupt wavy boundary.

A—2 to 7 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; friable; many fine and medium roots; about 5 percent cobbles; extremely acid; abrupt smooth boundary.

E—7 to 9 inches; dark gray (10YR 4/1) loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; about 2 percent cobbles; very strongly acid; clear broken boundary.

Bs—9 to 15 inches; brown (7.5YR 4/4) sandy loam; few fine distinct grayish brown (10YR 5/2), few fine prominent yellowish red (5YR 5/8), and few medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; many fine and medium roots; about 5 percent cobbles; very strongly acid; clear wavy boundary.

Ex—15 to 32 inches; grayish brown (10YR 5/2) sandy loam; many medium prominent strong brown (7.5YR 5/6) and common medium prominent yellowish red (5YR 5/8) mottles; moderate thick platy structure; firm; few fine roots; few fine and medium vesicular pores; about 6 percent cobbles; very strongly acid; abrupt wavy boundary.

Ex/Bx—32 to 38 inches; about 70 percent grayish brown (10YR 5/2) sandy loam (E) surrounding peds of reddish brown (5YR 4/4) sandy loam (B); common coarse prominent yellowish red (5YR 4/6) mottles; moderate thick platy structure; very firm; common fine vesicular pores; few clay films in cavities and on faces of peds; about 6 percent cobbles; strongly acid; abrupt wavy boundary.

2C—38 to 60 inches; grayish brown (10YR 5/2) cobbly sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; about 15 percent cobbles and 10 percent gravel; moderately acid.

Unless otherwise stated, the depth ranges in this paragraph are measured from the top of the mineral material. The thickness of the solum ranges from 36 to 64 inches. The content of gravel ranges from 0 to 10 percent in the solum and from 5 to 20 percent in the C horizon. The content of cobbles ranges from 5 to 10 percent in the solum and from 5 to 15 percent in the C horizon. Depth to the fragipan ranges from 12 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6, and chroma of 1 or 2.

The Bs horizon has hue of 7.5YR or 10YR and value and chroma of 3 or 4. It is loam, fine sandy loam, or sandy loam.

The Ex horizon and the E part of the Ex/Bx horizon have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 3. They are sandy loam, loamy sand, or cobbly loamy sand. The B part of the Bx/Ex horizon has hue of 5YR or 7.5YR and value and chroma of 4 to 6. It is fine sandy loam or sandy loam.

The 2C horizon has value of 4 or 5 and chroma of 2 to 4. It is sandy loam, cobbly sandy loam, or loamy sand. In some pedons it has thin bands or pockets of silt loam.

Vilas Series

The Vilas series consists of very deep, excessively drained soils on outwash plains. These soils formed in sandy glacial outwash deposits. Permeability is rapid. Slopes range from 1 to 35 percent.

Typical pedon of Vilas loamy sand, in an area of Vilas-Karlin complex, 1 to 6 percent slopes; 1,420 feet north and 2,100 feet east of the southwest corner of sec. 16, T. 42 N., R. 32 W.

A—0 to 4 inches; dark reddish brown (5YR 2/2) loamy sand, dark reddish gray (5YR 4/2) dry; weak medium granular structure; very friable; many fine roots; very strongly acid; abrupt wavy boundary.
E—4 to 5 inches; dark reddish gray (5YR 4/2) loamy sand; weak fine subangular blocky structure; very friable; many fine and medium roots; very strongly acid; abrupt broken boundary.
Bs1—5 to 12 inches; dark reddish brown (5YR 3/4) loamy sand; weak fine subangular blocky structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.
Bs2—12 to 17 inches; dark brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; common fine and medium roots; strongly acid; clear wavy boundary.
BC—17 to 24 inches; dark brown (7.5YR 4/4) sand; single grain; loose; common fine and medium roots; strongly acid; clear wavy boundary.
C1—24 to 41 inches; brown (7.5YR 5/4) sand; single grain; loose; few fine roots; about 5 percent gravel; strongly acid; abrupt wavy boundary.
C2—41 to 60 inches; light brown (7.5YR 6/4) sand; single grain; loose; few fine roots; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile. The content of stones on the surface ranges from less than 0.01 to 0.1 percent.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 to 3. The E horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 1 or 2. The A and E horizons are loamy sand.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 4 to 6. It is loamy sand. The BC and C horizons have hue of 10YR to 5YR, value of 4 to 6, and chroma of 4 to 8. They are sand.

Wabeno Series

The Wabeno series consists of very deep, moderately well drained soils on ground moraines and end moraines. These soils formed in modified loamy eolian deposits and in the underlying loamy and sandy glacial till. They are moderately deep to a fragipan. Permeability is moderate above the fragipan, moderately slow in the fragipan, and moderate in the substratum. Slopes range from 1 to 18 percent.

Typical pedon of Wabeno silt loam, 6 to 18 percent slopes, very stony, 1,850 feet north and 1,900 feet east of the southwest corner of sec. 36, T. 43 N., R. 34 E.

A—0 to 2 inches; black (5YR 2/1) silt loam, very dark gray (5YR 3/1) dry; weak fine granular structure; friable; many fine roots; about 5 percent gravel; strongly acid; abrupt wavy boundary.
E—2 to 4 inches; brown (7.5YR 4/2) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel; strongly acid; abrupt broken boundary.
Bs1—4 to 11 inches; dark brown (7.5YR 3/4) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel; strongly acid; gradual wavy boundary.
Bs2—11 to 23 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel; strongly acid; clear wavy boundary.
B/E—23 to 32 inches; about 80 percent dark brown (7.5YR 4/4) silt loam (B) that has brown (10YR 5/3) silt loam (E) on faces of peds; common medium distinct strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; friable; few fine roots; about 5 percent gravel; strongly acid; clear irregular boundary.
Bx/Ex—32 to 42 inches; about 80 percent dark brown (7.5YR 4/4) very fine sandy loam (Bx) that has brown (10YR 5/3) very fine sandy loam (Ex) on faces of peds; common fine distinct strong brown (7.5YR 4/6) mottles; weak thin platy structure; very firm; common fine vesicular pores; about 8 percent gravel; moderately acid; clear irregular boundary.
2Btx—42 to 50 inches; dark brown (7.5YR 4/4) sandy loam; weak medium platy structure; very firm; common fine vesicular pores; common reddish brown (5YR 5/4) clay films in pebble casings and pores; about 10 percent gravel; moderately acid; gradual wavy boundary.
2C—50 to 60 inches; brown (7.5YR 4/4) sandy loam; massive; friable; about 10 percent gravel; moderately acid.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the eolian material ranges from 20 to 38 inches. Depth to the fragipan ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent in the upper part of the solum and from 5 to 25 percent in the lower part of the solum and in the 2C horizon. The content of cobbles ranges from 0 to 10 percent in the upper part of the solum and from 0 to 20 percent in the lower part of the solum and in the 2C horizon. The content of stones on the surface ranges from 0.01 to 3.0 percent.

The A horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 or 3. The A and E horizons are silt loam.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4. It is silt loam. The B/E horizon

also is silt loam. The B part of the B/E horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 4 or 5. The E part has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3.

The E part of the Bx/Ex horizon has colors similar to those of the E part of the B/E horizon. It is very fine sandy loam, cobbly loamy sand, or loam. The B part has colors similar to those of the B part of the B/E horizon. It is very fine sandy loam, sandy loam, cobbly sandy loam, or loam.

The 2Btx horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or gravelly sandy loam.

The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam, loamy sand, or the gravelly or cobbly analogs of those textures. In some pedons it has thin strata or pockets of sand and coarse sand.

Waucedah Series

The Waucedah series consists of very deep, poorly drained or very poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvial deposits. Slopes are 0 to 1 percent.

Typical pedon of Waucedah muck, in an area of Waucedah-Cathro mucks, frequently flooded; 1,740 feet north and 1,220 feet east of the southwest corner of sec. 16, T. 42 N., R. 32 W.

Oa—0 to 10 inches; black (5YR 2/1) muck; weak medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Cg1—10 to 36 inches; grayish brown (10YR 5/2) fine sandy loam; thin layers of sand and partially decomposed vegetation; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; moderately acid; diffuse smooth boundary.

Cg2—36 to 60 inches; dark grayish brown (10YR 4/2) fine sandy loam; thin layers of sand, fine sand, and partially decomposed vegetation; massive; friable; moderately acid.

The Oa horizon has hue of 10YR to 5YR or is neutral in hue. It has value of 2 and chroma of 0 or 1. Some pedons have an A horizon. This horizon has hue of 10YR to 5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is fine sandy loam or loam.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 to 3. It is fine sandy loam, sandy loam, or loam. Thin strata of gravelly sand, sand, fine sand, loamy sand, loamy fine sand, silt loam, clay loam, or organic material are common. The total content of rock fragments is less than 5 percent.

Witbeck Series

The Witbeck series consists of very deep, poorly drained, moderately permeable or moderately slowly permeable soils on ground moraines and end moraines. These soils formed in loamy glacial till. Slopes range from 0 to 2 percent.

Typical pedon of Witbeck muck, in an area of Net-Witbeck complex, 0 to 4 percent slopes, very stony; 550 feet east and 1,340 feet north of the southwest corner of sec. 3, T. 46 N., R. 32 W.

Oa—0 to 5 inches; black (5YR 2/1) muck; weak fine granular structure; friable; many fine and medium roots; strongly acid; abrupt wavy boundary.

A—5 to 8 inches; black (5YR 2/1) silt loam, very dark gray (5YR 3/1) dry; weak fine granular structure; friable; many fine and medium roots; about 5 percent cobbles; strongly acid; abrupt wavy boundary.

Bg—8 to 18 inches; dark brown (7.5YR 4/2) silt loam; common fine prominent yellowish red (5YR 4/6) mottles; weak fine subangular blocky structure; friable; few fine and medium roots; about 5 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

Cg1—18 to 31 inches; grayish brown (2.5Y 5/2) fine sandy loam; common fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; about 5 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Cg2—31 to 51 inches; grayish brown (10YR 5/2) fine sandy loam; many coarse prominent brown (7.5YR 4/4) and few medium faint gray (10YR 6/1) mottles; massive; friable; about 5 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

C—51 to 60 inches; brown (10YR 4/3) gravelly sandy loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; about 20 percent gravel and 5 percent cobbles; strongly acid.

The thickness of the solum ranges from 18 to 24 inches. The content of gravel ranges from 0 to 10 percent in the A horizon and from 5 to 35 percent in the B and C horizons. The content of cobbles ranges from 5 to 15 percent throughout the profile. The content of stones on the surface ranges from 0.1 to 3.0 percent.

The Oa horizon has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or cobbly silt loam. The B horizon has hue of 7.5YR to 2.5Y, value of 3 to 5,

and chroma of 1 to 4. It is silt loam, very fine sandy loam, fine sandy loam, or the gravelly or cobbly analogs of those textures.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 to 4. It is fine sandy loam, sandy loam, very fine sandy loam, or the gravelly or cobbly analogs of those textures. Thin strata of sand or loamy sand are common.

Formation of the Soils

This section relates the factors of soil formation to the soils in Iron County. It also describes the processes of soil formation.

Factors of Soil Formation

Soil formation is the natural development of horizons in a profile. Soil forms through the interaction of five major factors—the physical, chemical, and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material (Jenny, 1941).

Climate and plant and animal life are the active forces of soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material affects the kind of soil profile that forms. In extreme cases, it determines the soil profile entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always needed for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soils that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. Nearly all of the parent materials of the soils in Iron County were deposited by glaciers or by glacial meltwater. Some of the glacial material has been reworked and redeposited by the subsequent action of water and wind. Although most of the parent materials are of a common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Iron County were deposited as glacial till, outwash, eolian material, alluvium, and organic material.

Glacial till was deposited directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. Trenary and Keweenaw soils are examples of soils that formed in glacial till on till plains and moraines.

Outwash was deposited by running water from melting glaciers. The size of the particles varies according to the speed of the stream that carried them. As the speed of the stream decreased, the coarser particles were deposited. Only the finer particles, such as very fine sand, silt, and clay, can be carried by slow-moving water. Outwash deposits generally occur as layers of particles of similar size, such as sand, gravel, or other coarse particles. Vilas and Pence soils are examples of soils that formed in deposits of outwash.

Eolian material was redeposited by wind after initial deposition by glaciers or meltwater from the glaciers. These deposits are typically very fine sandy loam or silt loam and occur as a layer 2 or 3 feet thick over glacial till or outwash material. Wabeno and Champion soils are examples of soils that formed in eolian material over glacial till. Stambaugh and Sundog soils are examples of soils that formed in eolian material over outwash. Because eolian deposits in Iron County are thin, there has been some modification or mixing of the eolian material with the underlying material. Freeze-thaw cycles and the uprooting of trees by the wind are two possible causes of this modification.

Alluvium is material recently deposited by floodwater from streams. This material varies in texture, depending on the speed of the water from which it was deposited. Waucedah soils are examples of soils that formed in alluvium.

Organic material occurs as deposits of plant remains. After the glaciers receded, water was left standing in depressions on outwash plains, flood plains, moraines, and till plains. Because of the wetness, the grasses, sedges, and water-tolerant plants that grew around the

edges of these depressions did not decompose quickly after they died. Eventually, the plant residue filled the depressions and decomposed into muck. Lupton soils are examples of soils that formed in organic material.

Plant and Animal Life

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. Additions of organic matter and nitrogen to the soil, gains or losses in plant nutrients, and alterations in soil structure and porosity are among the changes caused by living organisms. In this survey area, vegetation, dominantly hardwood and coniferous trees, has affected soil formation more than the other living organisms.

Climate

Climate determines the kind of plant and animal life on and in the soil and the amount of water available for the weathering of minerals and the translocation of soil material. Through its influence on soil temperature, climate also determines the rate of chemical reaction in the soil.

The climate in Iron County is cool and humid. It is generally uniform throughout the county. It is presumably similar to the climate under which the soils formed. The soils in this county differ from the soils that formed under a dry, warm climate and from those that formed under a moist, hot climate. Differences in climate account for only minor differences among the soils within the county.

Relief

Relief affects the natural drainage of soils, the rate of erosion, the kind of plant cover, and the soil temperature. Slopes range from 0 to 60 percent in Iron County. The soils range from excessively drained on sandy ridgetops to very poorly drained in depressions.

Through its effect on soil aeration, drainage determines the color of the soil. Water and air move freely through well drained soils and slowly through very poorly drained soils. In Wabeno and other well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Witbeck and other poorly aerated soils are dull gray or mottled because the iron compounds are reduced. The Wabeno and Witbeck soils formed in similar kinds of parent material.

Time

Generally, a long time is required for the development of distinct soil horizons. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly, and others form slowly.

The soils in Iron County range in geologic age from young to mature. The glacial deposits in which most of the soils formed have been exposed to soil-forming factors long enough for distinct horizons to develop. Soils that formed in recent alluvial material have not been in place long enough for the development of distinct horizons. Waucedah soils are examples of young alluvial soils. Champion soils are examples of mature soils.

Processes of Soil Formation

The processes responsible for the development of soil horizons in the parent material are referred to as soil genesis. Several processes were involved in the development of horizons in the soils of Iron County—the accumulation of organic matter, the leaching of lime (calcium carbonate) and other bases, the reduction and transfer of iron, the formation and translocation of silicate clay minerals, and the development of soil structure. In most of the soils, more than one of these processes have been active in the development of horizons.

As organic matter accumulates at the surface of a soil, an A horizon forms. In general, the A horizon in wet soils is thicker and has a higher content of organic matter than the A horizon in well drained soils. The poorly drained Witbeck soils, for example, have an A horizon that is thicker and darker than that in the well drained Wabeno soils.

The leaching of carbonates and other bases has occurred in most of the soils in the county. The leaching of bases generally precedes the translocation of silicate clay minerals. Many of the soils are moderately leached or strongly leached. For example, Oconto soils are leached of carbonates to a depth of about 35 inches and Padus soils are leached to a depth of more than 60 inches. Differences in the depth of leaching are primarily a result of differences in the parent material. Most of the parent material in Iron County probably did not contain carbonates at the time of deposition.

Gleying, or the reduction and transfer of iron, is evident in somewhat poorly drained to very poorly drained soils, such as Minocqua soils. A gray subsoil in these soils indicates the reduction and loss of iron. Some horizons have mottles, which indicate the segregation of iron. This process has taken place in Gaastra soils.

The translocation of clay minerals has contributed to horizon development in some soils. An eluviated, or leached, E horizon typically is lower in content of clay than the illuviated Bt horizon and typically is lighter in

color. The Bt horizon typically has an accumulation of clay or clay films in pores and on the faces of peds. Soils at this stage of formation, such as Peavy soils, probably were leached of carbonates and soluble salts to a considerable extent before the silicate clays were translocated.

In many of the soils in Iron County, iron, aluminum, and humus have been transferred from the A and E horizons to the illuvial Bs horizon. Au Gres and Vilas soils are examples of soils in which this process has taken place.

With the passage of time, the primary soil particles of sand, silt, and clay become combined or arranged into secondary compound particles, or peds. The causes of this aggregation may be physical processes, such as wetting and drying and freezing and thawing cycles; chemical weathering processes; and the activities of organisms, such as earthworms. Soil structure is important because it affects aeration and permeability. The ability of a soil to support plants and its response to management depend as much on soil structure as on fertility.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression. A landform position that is sunken or lower than adjacent positions.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil

readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Dune. A mound, ridge, or hill of loose, windblown sand, either bare or covered with vegetation.

Ecological land type. An ecological unit designed for resource management planning for a management area or landscape area (several thousand acres). The aerial extent of individual map unit delineations generally ranges from about 10 acres to hundreds of acres.

Ecological land type phase. An ecological unit designed for resource management planning at the project level. The aerial extent of individual map unit delineations generally ranges from 1 acre to not more than 100 acres, depending on the uniformity of the ecosystem.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all

organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or

blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Land type association. An ecological unit designed for overview resource management planning for an entire National forest or another area of comparable size, generally hundreds of thousands of acres. The aerial extent of individual map unit delineations can range from about 10 acres to thousands of acres.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones

adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat. Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material. (See Hemic soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 tc 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or

pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, typically sharp crested with steep sides and forming an extended upland between valleys.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. A miscellaneous area consisting of exposures of bare rock. Lava flows and rock-lined pits are not considered rock outcrop.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Nearly level and gently sloping	1 to 6 percent
Strongly sloping	6 to 18 percent
Moderately steep	18 to 35 percent
Steep	35 to 45 percent
Very steep	45 to 60 percent

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Nearly level and undulating	1 to 6 percent
Rolling	6 to 18 percent
Hilly	18 to 35 percent
Steep	35 to 45 percent
Very steep	45 to 60 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1956-85 at Beechwood, Crystal Falls, and Stambaugh, Michigan)

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average		2 years in 10 will have--		Average	
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
BEECHWOOD:											
January------	20.4	0.9	10.6	43	-30	0	1.28	0.68	1.81	4	21.5
February-----	26.2	3.9	15.1	51	-28	0	1.20	.58	1.73	4	16.7
March--------	37.0	13.9	25.4	60	-19	0	1.75	.85	2.53	4	16.2
April--------	51.6	27.8	39.7	79	3	28	2.54	1.60	3.39	5	7.4
May----------	65.8	38.9	52.3	86	18	159	3.73	2.30	5.03	7	1.3
June---------	73.1	48.0	60.5	89	29	322	4.10	2.77	5.32	8	.0
July---------	77.7	53.4	65.6	91	37	482	3.55	2.16	4.79	7	.0
August-------	75.5	52.2	63.9	89	35	430	4.32	2.27	6.12	6	.0
September----	66.1	44.4	55.3	85	25	200	4.07	2.30	5.64	7	.0
October------	55.9	35.4	45.6	79	15	62	2.96	1.71	4.08	6	2.6
November-----	37.8	22.5	30.2	63	-5	2	2.42	1.38	3.34	6	16.5
December-----	24.7	8.1	16.4	47	-21	0	1.71	1.15	2.22	6	24.2
Yearly:											
Average-----	51.0	29.1	40.1	---	---	---	---	---	---	---	---
Extreme-----	96	-36	---	92	-31	---	---	---	---	---	---
Total-------	---	---	---	---	---	1,686	33.63	28.28	37.50	70	106.3
CRYSTAL FALLS:											
January------	19.6	-3.5	8.0	43	-34	0	1.15	0.51	1.70	3	15.7
February-----	24.7	-1.2	11.7	51	-35	0	.96	.37	1.44	2	11.3
March--------	35.4	10.3	22.8	61	-24	0	1.58	.79	2.27	4	11.5
April--------	50.1	25.7	37.9	82	-2	21	2.40	1.54	3.18	6	4.7
May----------	64.7	36.9	50.8	89	17	136	3.21	2.07	4.25	7	.5
June---------	72.9	46.0	59.5	92	28	295	3.89	2.50	5.14	7	.0
July---------	78.2	50.8	64.5	94	35	450	3.27	1.98	4.43	6	.0
August-------	75.1	49.0	62.1	91	31	376	3.66	2.04	5.09	6	.0
September----	65.4	41.2	53.3	87	23	156	3.83	2.07	5.39	7	.0
October------	54.4	32.7	43.6	80	13	44	2.40	1.23	3.42	5	.7
November-----	37.9	21.4	29.7	63	-7	0	2.07	1.05	2.95	5	8.7
December-----	24.5	5.8	15.1	46	-25	0	1.50	.94	2.01	4	17.6
Yearly:											
Average-----	50.2	26.3	38.2	---	---	---	---	---	---	---	---
Extreme-----	99	-42	---	96	-37	---	---	---	---	---	---
Total-------	---	---	---	---	---	1,477	29.92	25.96	33.30	62	70.8

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average		2 years in 10 will have--		Average	
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
STAMBAUGH:											
January------	21.4	-0.9	10.3	44	-34	0	1.13	0.59	1.61	3	16.1
February-----	27.0	1.7	14.4	52	-34	0	.97	.36	1.48	2	11.7
March--------	37.4	13.2	25.3	60	-23	0	1.60	.74	2.35	4	11.9
April--------	52.5	27.2	39.8	81	0	30	2.51	1.58	3.36	6	5.8
May----------	66.1	37.9	52.0	87	18	151	3.68	2.34	4.89	7	1.3
June---------	74.1	46.6	60.3	90	28	316	3.92	2.77	4.98	8	.0
July---------	78.7	51.5	65.1	92	34	469	3.45	2.35	4.46	7	.0
August-------	76.3	50.0	63.1	91	30	409	4.24	2.25	5.99	7	.0
September----	66.7	42.1	54.4	87	21	182	3.85	2.11	5.39	7	.0
October------	56.5	34.1	45.3	80	13	57	2.60	1.29	3.73	5	1.3
November-----	39.0	21.9	30.4	64	-6	2	2.12	1.10	3.01	5	11.0
December-----	25.8	7.2	16.5	49	-26	0	1.60	.99	2.16	4	17.9
Yearly:											
Average-----	51.8	27.7	39.8	---	---	---	---	---	---	---	---
Extreme-----	98	-44	---	94	-37	---	---	---	---	---	---
Total-------	---	---	---	---	---	1,616	31.68	27.42	35.54	65	76.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1956-85 at Beechwood and Stambaugh, Michigan, and 1962-85 at Crystal Falls, Michigan)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
BEECHWOOD:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 20	June 3	June 22
2 years in 10 later than--	May 14	May 28	June 16
5 years in 10 later than--	May 5	May 18	June 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 24	Sept. 12	Sept. 3
2 years in 10 earlier than--	Oct. 1	Sept. 17	Sept. 8
5 years in 10 earlier than--	Oct. 13	Sept. 27	Sept. 17
CRYSTAL FALLS:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 24	June 9	June 22
2 years in 10 later than--	May 19	June 5	June 18
5 years in 10 later than--	May 9	May 27	June 9
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 20	Sept. 6	Aug. 15
2 years in 10 earlier than--	Sept. 26	Sept. 12	Aug. 21
5 years in 10 earlier than--	Oct. 7	Sept. 22	Sept. 2

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
STAMBAUGH:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 23	June 8	June 30
2 years in 10 later than--	May 18	June 3	June 24
5 years in 10 later than--	May 8	May 24	June 12
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 13	Sept. 5	Aug. 12
2 years in 10 earlier than--	Sept. 20	Sept. 9	Aug. 19
5 years in 10 earlier than--	Oct. 2	Sept. 17	Aug. 31

TABLE 3.--GROWING SEASON

(Recorded in the period 1956-85 at Beechwood and Stambaugh, Michigan, and 1962-85 at Crystal Falls, Michigan)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
BEECHWOOD:			
9 years in 10	136	107	85
8 years in 10	145	116	92
5 years in 10	161	131	104
2 years in 10	177	147	116
1 year in 10	185	155	122
CRYSTAL FALLS:			
9 years in 10	126	97	59
8 years in 10	134	104	68
5 years in 10	150	117	84
2 years in 10	166	131	100
1 year in 10	174	138	109
STAMBAUGH:			
9 years in 10	120	92	48
8 years in 10	129	100	59
5 years in 10	146	115	79
2 years in 10	163	130	100
1 year in 10	172	137	111

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
50	Aquents and Histosols, ponded	6,988	0.9
51	Lupton-Cathro-Humaquepts complex	39,618	5.2
52	Greenwood and Merwin peats	18,710	2.4
53	Waucedah-Cathro mucks, frequently flooded	11,627	1.5
54	Pits, sand and gravel	495	0.1
55A	Oconto very fine sandy loam, 1 to 2 percent slopes	3,717	0.5
55B	Oconto very fine sandy loam, 2 to 6 percent slopes	617	0.1
55D	Oconto very fine sandy loam, 6 to 18 percent slopes	401	0.1
56	Pits and dumps, mine	887	0.1
57A	Padus fine sandy loam, 1 to 2 percent slopes	2,082	0.3
57B	Padus fine sandy loam, 2 to 6 percent slopes	6,940	0.9
57D	Padus fine sandy loam, 6 to 18 percent slopes, stony	7,090	0.9
57F	Padus fine sandy loam, 18 to 35 percent slopes, stony	3,076	0.4
58B	Trenary fine sandy loam, 1 to 6 percent slopes, stony	2,097	0.3
58D	Trenary fine sandy loam, 6 to 18 percent slopes, stony	1,985	0.3
59A	Solona very fine sandy loam, 0 to 3 percent slopes, stony	941	0.1
60D	Trenary-Rock outcrop complex, 1 to 18 percent slopes, very stony	448	0.1
64A	Channing very fine sandy loam, 0 to 3 percent slopes	2,029	0.3
65	Witbeck muck, very stony	3,620	0.5
67B	Net very fine sandy loam, 0 to 4 percent slopes, very stony	3,135	0.4
68B	Net-Witbeck complex, 0 to 4 percent slopes, very stony	12,199	1.6
69A	Karlin, moderately wet-Croswell complex, 0 to 3 percent slopes	11,053	1.4
70B	Sundog-Channing very fine sandy loams, 0 to 6 percent slopes, rocky, stony	592	0.1
71D	Karlin-Vilas-Rock outcrop complex, 1 to 18 percent slopes, stony	4,194	0.5
72B	Karlin fine sandy loam, 1 to 6 percent slopes	3,397	0.4
72D	Karlin fine sandy loam, 6 to 18 percent slopes	1,693	0.2
72F	Karlin fine sandy loam, 18 to 35 percent slopes	446	0.1
73A	Gaastra silt loam, 0 to 3 percent slopes, stony	3,935	0.5
74A	Au Gres sand, 0 to 3 percent slopes	885	0.1
75	Kinross muck	505	0.1
76	Ensley fine sandy loam, stony	218	*
77B	Vilas loamy sand, 1 to 6 percent slopes	5,411	0.7
77D	Vilas loamy sand, 6 to 18 percent slopes	2,738	0.4
78B	Vilas-Karlin complex, 1 to 6 percent slopes	10,682	1.4
78D	Vilas-Karlin complex, 6 to 18 percent slopes	10,792	1.4
78F	Vilas-Karlin complex, 18 to 35 percent slopes	1,047	0.1
79A	Fence silt loam, 1 to 2 percent slopes	127	*
79B	Fence silt loam, 2 to 6 percent slopes	291	*
79D	Fence silt loam, 6 to 18 percent slopes	48	*
80B	Pence fine sandy loam, 1 to 6 percent slopes	5,311	0.7
80D	Pence fine sandy loam, 6 to 18 percent slopes	3,947	0.5
80F	Pence fine sandy loam, 18 to 35 percent slopes	100	*
82B	Keweenaw loamy fine sand, 1 to 6 percent slopes	997	0.1
82D	Keweenaw loamy fine sand, 6 to 18 percent slopes	861	0.1
82F	Keweenaw loamy fine sand, 18 to 35 percent slopes	670	0.1
100B	Keweenaw-Karlin complex, 1 to 6 percent slopes	846	0.1
100D	Keweenaw-Karlin complex, 6 to 18 percent slopes	152	*
101B	Trenary-Solona complex, 0 to 6 percent slopes, stony	300	*
102B	Escanaba loamy fine sand, 1 to 6 percent slopes	544	0.1
103B	Wabeno-Sarona complex, 1 to 6 percent slopes, stony	2,975	0.4
103D	Wabeno-Sarona complex, 6 to 18 percent slopes, stony	1,429	0.2
104A	Stambaugh silt loam, 1 to 2 percent slopes, stony	1,440	0.2
104B	Stambaugh silt loam, 2 to 6 percent slopes, stony	5,949	0.8
104D	Stambaugh silt loam, 6 to 18 percent slopes, stony	3,273	0.4
105D	Wabeno-Rock outcrop complex, 1 to 18 percent slopes, very stony	5,855	0.8
106D	Champion very fine sandy loam, 1 to 18 percent slopes, rocky, very stony	690	0.1
107B	Sarona fine sandy loam, 1 to 6 percent slopes, stony	2,797	0.4
107D	Sarona fine sandy loam, 6 to 18 percent slopes, stony	1,296	0.2
107F	Sarona fine sandy loam, 18 to 35 percent slopes, stony	969	0.1
108D	Sarona-Rock outcrop complex, 1 to 18 percent slopes, very stony	6,782	0.9
108F	Sarona-Rock outcrop complex, 18 to 35 percent slopes, very stony	1,128	0.1
109D	Udorthents, nearly level to rolling	1,125	0.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
110B	Petticoat-Wabeno silt loams, 1 to 6 percent slopes, very stony	28,843	3.7
110D	Petticoat-Wabeno silt loams, 6 to 18 percent slopes, very stony	7,834	1.0
111B	Champion-Net very fine sandy loams, 0 to 6 percent slopes, very stony	12,727	1.6
112B	Sundog very fine sandy loam, 1 to 6 percent slopes	7,809	1.0
112D	Sundog very fine sandy loam, 6 to 18 percent slopes	15,582	2.0
112F	Sundog cobbly fine sandy loam, 18 to 50 percent slopes, stony	3,835	0.5
113A	Sundog very fine sandy loam, moderately wet, 0 to 3 percent slopes	7,875	1.0
114A	Minocqua-Channing complex, 0 to 3 percent slopes	18,993	2.5
115A	Manitowish fine sandy loam, 0 to 3 percent slopes	4,187	0.5
116B	Wabeno silt loam, 1 to 6 percent slopes, very stony	32,696	4.3
116D	Wabeno silt loam, 6 to 18 percent slopes, very stony	25,366	3.3
121B	Peavy silt loam, 1 to 6 percent slopes, stony	4,893	0.6
121D	Peavy silt loam, 6 to 18 percent slopes, stony	3,338	0.4
122B	Sarona-Karlin fine sandy loams, 1 to 6 percent slopes, stony	6,732	0.9
122D	Sarona-Karlin fine sandy loams, 6 to 18 percent slopes, stony	6,964	0.9
123B	Ocqueoc loamy fine sand, 1 to 6 percent slopes	231	*
123D	Ocqueoc loamy fine sand, 6 to 18 percent slopes	511	0.1
124B	Wabeno-Net silt loams, 0 to 6 percent slopes, very stony	6,417	0.8
125B	Wabeno-Net silt loams, 0 to 6 percent slopes, rocky, very stony	1,804	0.2
126B	Champion very fine sandy loam, 1 to 6 percent slopes, very stony	13,240	1.7
126D	Champion very fine sandy loam, 6 to 18 percent slopes, very stony	9,995	1.3
126F	Champion very fine sandy loam, 18 to 35 percent slopes, very stony	824	0.1
127D	Goodman silt loam, 1 to 18 percent slopes, rocky, very stony	376	*
128B	Goodman-Wabeno-Sundog, sandy substratum, complex, 1 to 6 percent slopes, stony	3,865	0.5
128D	Goodman-Wabeno-Sundog, sandy substratum, complex, 6 to 18 percent slopes, stony	6,628	0.9
128F	Goodman-Sundog, sandy substratum, complex, 18 to 45 percent slopes, stony	1,784	0.2
163B	Sagola fine sandy loam, 1 to 6 percent slopes, stony	394	0.1
163D	Sagola fine sandy loam, 6 to 18 percent slopes, stony	2,147	0.3
163F	Sagola fine sandy loam, 18 to 35 percent slopes, stony	120	*
164B	Alstad loam, 0 to 6 percent slopes	69	*
165B	Sundog-Channing very fine sandy loams, 0 to 6 percent slopes	3,446	0.4
166F	Soperton silt loam, 18 to 35 percent slopes, very stony	4,249	0.5
167A	Monico loam, 0 to 3 percent slopes	44	*
168F	Soperton-Rock outcrop complex, 18 to 35 percent slopes, very stony	239	*
500B	Wabeno silt loam, nearly level and undulating, very stony	36,199	4.8
500D	Wabeno silt loam, rolling, very stony	20,053	2.6
501F	Soperton silt loam, hilly, very stony	3,908	0.5
502B	Champion very fine sandy loam, moderately wet, nearly level and undulating, very stony	33,746	4.5
502D	Champion very fine sandy loam, moderately wet, rolling, very stony	10,877	1.4
502F	Champion very fine sandy loam, hilly, very stony	2,383	0.3
503A	Typic Fragiaquods, coarse-loamy, nearly level	4,769	0.6
504B	Pence fine sandy loam, nearly level and undulating	10,730	1.4
504D	Pence fine sandy loam, rolling	1,709	0.2
504F	Pence fine sandy loam, hilly	292	*
505	Humaquepts, acid, very stony	670	0.1
506	Humaquepts, nonacid, very stony	4,419	0.6
507A	Monico loam, nearly level	2,492	0.3
508A	Beechwood silt loam, nearly level	3,485	0.4
509A	Typic Dystrochrepts, coarse-loamy, deep water table, nearly level	703	0.1
510	Borosaprists, nonacid	12,077	1.6
511B	Typic Dystrochrepts, coarse-loamy, sandy substratum, nearly level and undulating	1,316	0.2
511D	Typic Dystrochrepts, coarse-loamy, sandy substratum, rolling	1,217	0.2
511F	Typic Dystrochrepts, coarse-loamy, sandy substratum, hilly	5,118	0.7
512	Borosaprists, acid	5,118	0.7
513B	Entic Haplorthods, coarse-loamy, deep water table, nearly level and undulating	1,241	0.2
514B	Stambaugh silt loam, moderately wet, nearly level and undulating, stony	3,225	0.4
515	Borosaprists, frequently flooded	1,389	0.2
516B	Fragiorthods, nearly level and undulating	3,730	0.5
516D	Fragiorthods, rolling	1,582	0.2
517B	Lode silt loam, nearly level and undulating	6,270	0.8
517D	Lode silt loam, rolling	944	0.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
517F	Lode silt loam, hilly	62	*
518	Humaquepts, sandy substratum	3,636	0.5
519A	Monico loam, sandy substratum, nearly level	1,634	0.2
520B	Haplorthods, deep water table, nearly level and undulating	2,582	0.3
521B	Pence sandy loam, very deep water table, nearly level and undulating	3,781	0.5
522D	Entic Fragiorthods, coarse-loamy-Typic Dystrochrepts complex, nearly level to hilly, rocky, stony	1,973	0.3
523B	Entic Haplorthods-Typic Haplaquepts complex, nearly level and undulating	2,979	0.4
524D	Haplorthods, bedrock substratum, rolling, rocky	251	*
524F	Haplorthods, bedrock substratum, hilly to very steep, rocky	159	*
525B	Entic Haplorthods, sandy-skeletal, nearly level and undulating	1,247	0.2
525D	Entic Haplorthods, sandy-skeletal, rolling and hilly	2,494	0.3
525F	Entic Haplorthods, sandy-skeletal, steep and very steep	48	*
527	Borohemists-Borosaprists, acid, complex	4,590	0.6
528	Borohemists, acid	869	0.1
529	Borohemists, nonacid	2,593	0.3
530	Borosaprists-Histic Humaquepts, nonacid, complex	5,482	0.7
531C	Champion silt loam, nearly level to rolling, very stony	342	*
532F	Champion-Haplorthods complex, hilly, rocky, very stony	73	*
533B	Entic Fragiorthods, coarse-loamy, nearly level and undulating	45	*
534B	Entic Haplorthods, sandy, stratified substratum, nearly level and undulating	2,328	0.3
534D	Entic Haplorthods, sandy, stratified substratum, rolling	1,808	0.2
535B	Vilas loamy sand, nearly level and undulating	468	0.1
535D	Vilas loamy sand, rolling	42	*
536F	Entic Haplorthods, sandy-skeletal, esker, very steep	44	*
537B	Haplorthods, moderately deep water table, nearly level and undulating	112	*
538B	Entic Haplorthods, sandy substratum, nearly level and undulating	523	0.1
538D	Entic Haplorthods, sandy substratum, rolling	50	*
539B	Karlin sandy loam, very deep water table, nearly level and undulating	957	0.1
540B	Entic Fragiorthods-Typic Fragiaquods-Borosaprists, nonacid, complex, nearly level and undulating	1,503	0.2
541	Fluvaquents, frequently flooded	3,265	0.4
542B	Gogebic fine sandy loam, nearly level and undulating	2,598	0.3
542D	Gogebic fine sandy loam, rolling	2,029	0.3
542F	Gogebic fine sandy loam, well drained, hilly	331	*
543A	Haplaquods, nearly level	704	0.1
544C	Haplorthods, esker, rolling	46	*
544D	Haplorthods, esker, hilly	243	*
544F	Haplorthods, esker, steep	188	*
545B	Haplorthods, nearly level and undulating	5,288	0.7
545D	Haplorthods, rolling	24,333	3.1
545F	Haplorthods, hilly	1,806	0.2
546C	Entic Haplorthods, esker, rolling	42	*
546D	Entic Haplorthods, esker, hilly and steep	45	*
546F	Entic Haplorthods, esker, very steep	121	*
547B	Haplorthods, very deep water table, nearly level and undulating	306	*
548	Humaquepts-Terric Borosaprists, nonacid, complex, frequently flooded	976	0.1
549B	Karlin-Pence complex, nearly level and undulating	820	0.1
549D	Karlin-Pence complex, rolling	3,152	0.4
549F	Karlin-Pence complex, hilly	344	*
550	Terric Borosaprists, nonacid, frequently flooded	856	0.1
551A	Typic Fragiorthods, nearly level, stony	17	*
552F	Kalkaska sand, banded substratum, hilly	344	*
553D	Kalkaska loamy sand, rolling	47	*
554B	Alfic Fragiorthods, coarse-loamy, nearly level and undulating	12	*
555B	Entic Haplorthods, very deep water table, nearly level and undulating	313	*
556	Haplaquods, wet	123	*
	Water	24,156	3.1
	Total	775,091	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
55A	Oconto very fine sandy loam, 1 to 2 percent slopes
55B	Oconto very fine sandy loam, 2 to 6 percent slopes
57A	Padus fine sandy loam, 1 to 2 percent slopes
57B	Padus fine sandy loam, 2 to 6 percent slopes
79A	Fence silt loam, 1 to 2 percent slopes
79B	Fence silt loam, 2 to 6 percent slopes
101B	Trenary-Solona complex, 0 to 6 percent slopes
102B	Escanaba loamy fine sand, 1 to 6 percent slopes
112B	Sundog very fine sandy loam, 1 to 6 percent slopes
113A	Sundog very fine sandy loam, moderately wet, 0 to 3 percent slopes
164B	Alstad loam, 0 to 6 percent slopes (where drained)
165B	Sundog-Channing very fine sandy loams, 0 to 6 percent slopes (where drained)
167A	Monico loam, 0 to 3 percent slopes (where drained)
507A	Monico loam, nearly level (where drained)
508A	Beechwood silt loam, nearly level (where drained)
517B	Lode silt loam, nearly level and undulating
519A	Monico loam, sandy substratum, nearly level (where drained)

TABLE 6.--YIELDS PER ACRE OF CROPS

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Soils that are not likely to be used for crops are not listed)

Soil name and map symbol	Corn	Corn silage	Oats	Irish potatoes	Alfalfa hay	Bromegrass-alfalfa hay
	Bu	Tons	Bu	Cwt	Tons	Tons
55A, 558---------- Oconto	70	11	60	---	---	3.5
55D---------- Oconto	50	8	40	---	---	2.5
57A, 57B---------- Padus	70	11	70	---	---	4.0
57D---------- Padus	55	9	55	---	---	3.4
58B---------- Trenary	---	14	75	350	---	3.3
58D---------- Trenary	---	---	60	---	---	2.5
59A---------- Solona	85	14	75	---	---	4.5
64A---------- Channing	---	---	60	---	---	---
72B---------- Karlin	70	13	60	---	---	---
72D---------- Karlin	---	---	50	---	---	---
73A---------- Gaastra	---	---	85	---	---	2.8
79A---------- Fence	75	12	75	---	---	4.5
79B---------- Fence	70	11	75	---	---	4.5
79D---------- Fence	60	10	70	---	---	4.0
80B---------- Pence	60	10	55	---	---	3.5
80D---------- Pence	---	---	---	---	---	2.9
82B---------- Keweenaw	---	10	60	250	3.0	2.1
82D---------- Keweenaw	---	---	---	---	2.4	1.7
100B---------- Keweenaw-Karlin	---	12	60	250	3.0	2.1

TABLE 6.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Irish potatoes	Alfalfa hay	Bromegrass-alfalfa hay
	Bu	Tons	Bu	Cwt	Tons	Tons
100D---------- Keweenaw-Karlin	---	---	---	---	2.4	1.7
101B---------- Trenary-Solona	---	14	75	350	---	3.3
102B---------- Escanaba	75	12	70	350	3.5	---
103B---------- Wabeno-Sarona	---	13	75	---	3.5	2.5
103D---------- Wabeno-Sarona	---	---	---	---	3.0	2.0
104A---------- Stambaugh	---	14	80	350	4.0	3.0
104B---------- Stambaugh	---	14	75	350	4.0	3.0
104D---------- Stambaugh	---	---	60	---	3.0	2.0
107B---------- Sarona	80	13	65	---	---	3.7
107D---------- Sarona	---	---	---	---	---	3.1
112B---------- Sundog	---	---	55	275	---	3.0
112D---------- Sundog	---	---	---	---	---	2.0
113A---------- Sundog	---	---	60	275	---	3.0
115A---------- Manitowish	---	10	50	---	---	2.5
121B---------- Peavy	80	13	75	---	3.5	---
121D---------- Peavy	---	---	65	---	3.0	---
122B---------- Sarona-Karlin	76	13	62	---	---	3.7
122D---------- Sarona-Karlin	---	---	---	---	---	3.1
163B---------- Sagola	---	---	60	275	---	3.0
163D---------- Sagola	---	---	---	---	---	2.5
164B---------- Alstad	90	15	70	---	---	4.0

TABLE 6.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Irish potatoes	Alfalfa hay	Bromegrass-alfalfa hay
	Bu	Tons	Bu	Cwt	Tons	Tons
165B---------- Sundog-Channing	---	---	57	---	---	---
167A---------- Monico	---	12	60	---	---	3.0
504B---------- Pence	60	10	55	---	---	3.5
504D---------- Pence	---	---	---	---	---	2.9
507A---------- Monico	---	12	60	---	---	3.0
508A---------- Beechwood	---	---	70	---	---	---
514B---------- Stambaugh	---	14	75	350	4.0	3.0
517B---------- Lode	---	---	75	---	3.5	---
517D---------- Lode	---	---	---	---	2.5	---
519A---------- Monico	---	12	60	---	---	3.0
521B---------- Pence	60	10	55	---	---	3.5

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	127	---	---	---
II	47,450	30,158	10,790	6,502
III	97,930	28,861	17,079	51,990
IV	218,807	35,606	1,163	182,038
V	17,202	---	17,202	---
VI	132,676	34,475	48,873	49,328
VII	149,043	44,935	50,262	53,846
VIII	11,392	---	5,813	5,579

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
51:									
Lupton	2W	Slight	Severe	Severe	Severe	Black spruce	20	29	---
						Balsam fir	46	86	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Tamarack	---	---	
						Red maple	---	---	
						Quaking aspen	---	---	
						White spruce	---	---	
Cathro	5W	Slight	Severe	Severe	Severe	Balsam fir	40	71	---
						Northern whitecedar	15	21	
						Tamarack	35	23	
						Paper birch	---	---	
						Red maple	40	26	
						Black spruce	15	23	
						White spruce	---	---	
Humaquepts	---	Slight	Severe	Severe	Severe	---	---	---	---
52:									
Greenwood	2W	Slight	Severe	Severe	Severe	Black spruce	15	23	---
						Balsam fir	39	69	
						Tamarack	---	---	
Merwin	2W	Slight	Severe	Severe	Severe	Black spruce	25	35	---
						Tamarack	35	23	
53:									
Waucedah	3W	Slight	Severe	Severe	Severe	Northern whitecedar	30	42	---
						Balsam fir	40	71	
						Black ash	35	22	
						Quaking aspen	40	22	
						Red maple	---	---	
						Black spruce	---	---	
Cathro	5W	Slight	Severe	Severe	Severe	Balsam fir	40	71	---
						Northern whitecedar	15	21	
						Tamarack	35	23	
						Paper birch	---	---	
						Red maple	40	26	
						Black spruce	15	23	
						White spruce	---	---	
55A, 55B, 55D---Oconto	3L	Slight	Moderate	Slight	Slight	Sugar maple	70	43	Eastern white pine, red pine, white spruce.
						American basswood	---	---	
						White ash	---	---	
						Northern red oak	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
57A, 57B, 57D---Padus	3L	Slight	Moderate	Slight	Slight	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
57F---Padus	3R	Moderate	Moderate	Slight	Slight	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
58B, 58D---Trenary	3L	Slight	Moderate	Slight	Slight	Sugar maple	61	38	White spruce, red pine, eastern white pine.
						American basswood	65	59	
						Yellow birch	61	38	
						American beech	---	---	
						Quaking aspen	---	---	
						Balsam fir	---	---	
						Eastern hemlock	---	---	
59A---Solona	3W	Slight	Severe	Slight	Moderate	Sugar maple	64	40	Eastern white pine, white ash, white spruce.
						Northern red oak	---	---	
						White ash	---	---	
						American basswood	---	---	
60D:									
Trenary	3L	Slight	Slight	Slight	Slight	Sugar maple	61	38	White spruce, red pine, eastern white pine.
						American basswood	65	59	
						Yellow birch	61	38	
						American beech	---	---	
						Quaking aspen	---	---	
						Balsam fir	---	---	
						Eastern hemlock	---	---	
Rock outcrop.									
64A---Channing	2W	Slight	Severe	Moderate	Severe	Red maple	55	35	White spruce, eastern white pine.
						Quaking aspen	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
						Black spruce	---	---	
						White spruce	---	---	
						Northern whitecedar	---	---	
						Yellow birch	---	---	
65---Witbeck	5W	Slight	Severe	Severe	Severe	Black spruce	48	63	---
						Quaking aspen	---	---	
						White spruce	41	75	
						Balsam fir	48	90	
						Black ash	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern whitecedar	---	---	
						Tamarack	40	27	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
67B---------- Net	3W	Slight	Severe	Moderate	Severe	Red maple----------	60	38	White spruce, eastern white pine.
						Balsam fir----------	58	113	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						White spruce--------	49	94	
						Paper birch---------	53	53	
						Yellow birch--------	---	---	
						Eastern hemlock-----	---	---	
68B:									
Net----------	3W	Slight	Severe	Moderate	Severe	Red maple----------	60	38	White spruce, eastern white pine.
						Balsam fir----------	58	113	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						White spruce--------	49	94	
						Paper birch---------	53	53	
						Yellow birch--------	---	---	
						Eastern hemlock-----	---	---	
Witbeck--------	5W	Slight	Severe	Severe	Severe	Black spruce--------	48	63	---
						Quaking aspen-------	---	---	
						White spruce--------	41	75	
						Balsam fir----------	48	90	
						Black ash-----------	---	---	
						Yellow birch--------	---	---	
						Red maple-----------	---	---	
						Northern whitecedar-	---	---	
						Tamarack------------	40	27	
69A:									
Karlin---------	5A	Slight	Slight	Slight	Moderate	Quaking aspen-------	68	78	Red pine, jack pine, eastern white pine.
						Bigtooth aspen------	---	---	
						Red maple-----------	---	---	
						Northern red oak----	---	---	
						Red pine------------	---	---	
						Paper birch---------	---	---	
						Balsam fir----------	---	---	
Croswell-------	5S	Slight	Moderate	Moderate	Moderate	Quaking aspen-------	68	78	Red pine, eastern white pine, white spruce.
						Red pine------------	55	88	
						Jack pine-----------	53	73	
						Northern red oak----	---	---	
						Black cherry--------	---	---	
						Eastern white pine--	---	---	
						Bigtooth aspen------	69	80	
						Red maple-----------	---	---	
						Paper birch---------	54	55	
70B:									
Sundog---------	2L	Slight	Moderate	Slight	Slight	Red maple-----------	53	34	Red pine, white spruce.
						Eastern hemlock-----	---	---	
						Quaking aspen-------	65	73	
						Sugar maple---------	---	---	
						Red pine------------	75	142	
						Balsam fir----------	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
70B:									
Channing	2W	Slight	Severe	Moderate	Severe	Red maple	55	35	White spruce, northern whitecedar, eastern white pine.
						Balsam fir	54	105	
						Yellow birch	---	---	
						White spruce	---	---	
						Northern whitecedar	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Black spruce	---	---	
71D:									
Karlin	3A	Slight	Slight	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
Vilas	6A	Slight	Slight	Slight	Slight	Red pine	57	93	Red pine, eastern white pine, jack pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
Rock outcrop.									
72B, 72D Karlin	3A	Slight	Slight	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
72F Karlin	3R	Moderate	Moderate	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
73A Gaastra	3W	Slight	Severe	Slight	Moderate	Red maple	65	40	White spruce, eastern white pine.
						Quaking aspen	---	---	
						White ash	---	---	
						White spruce	---	---	
						Balsam fir	---	---	
						American elm	---	---	
						Sugar maple	---	---	
						American basswood	---	---	
						Black ash	---	---	
						Yellow birch	---	---	
						Black cherry	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
74A---------- Au Gres	6W	Slight	Severe	Moderate	Severe	Quaking aspen-------	70	81	White spruce, red pine, eastern white pine, Norway spruce.
						Bigtooth aspen------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Yellow birch--------	---	---	
						Red maple-----------	65	40	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Northern whitecedar-	---	---	
						Jack pine-----------	51	69	
						Red pine------------	61	104	
75---------- Kinross	2W	Slight	Severe	Severe	Severe	Quaking aspen-------	45	32	---
						Black spruce--------	---	---	
						Tamarack------------	---	---	
						Northern whitecedar-	---	---	
						Balsam fir----------	---	---	
						Red maple-----------	---	---	
						Jack pine-----------	---	---	
76---------- Ensley	2W	Slight	Severe	Severe	Severe	Red maple-----------	45	26	---
						White spruce--------	---	---	
77B, 77D-------- Vilas	6A	Slight	Slight	Slight	Slight	Red pine------------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine-----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
78B, 78D: Vilas----------	6A	Slight	Slight	Slight	Slight	Red pine------------	57	93	Red pine, jack pine, eastern white pine.
						Jack pine-----------	65	94	
						Eastern white pine--	56	109	
						Northern pin oak----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
						Red maple-----------	---	---	
						Paper birch---------	---	---	
Karlin---------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch--------	---	---	
						Bigtooth aspen------	---	---	
						Northern red oak----	---	---	
						American basswood---	---	---	
						Red pine------------	65	115	
						Eastern white pine--	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
78F:									
Vilas	6R	Moderate	Moderate	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
Karlin	3R	Moderate	Moderate	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
79A, 79B, 79D---Fence	3L	Slight	Severe	Slight	Slight	Sugar maple	65	40	Red pine, eastern white pine, white spruce.
						Yellow birch	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	
						Bigtooth aspen	---	---	
80B, 80D---Pence	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
80F---Pence	3R	Moderate	Moderate	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
82B, 82D---Keweenaw	3A	Slight	Slight	Slight	Slight	Sugar maple	61	38	Eastern white pine, red pine.
						Eastern hemlock	---	---	
						Yellow birch	---	---	
						Northern red oak	64	57	
						Paper birch	60	65	
						Red maple	50	32	
						Black cherry	---	---	
						Eastern white pine	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Red pine	60	101	
						Bigtooth aspen	74	86	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
82F---------- Keweenaw	3R	Moderate	Moderate	Slight	Slight	Sugar maple---------	61	38	Eastern white pine, red pine.
						Eastern hemlock-----	---	---	
						Yellow birch--------	---	---	
						Northern red oak----	64	57	
						Paper birch---------	60	65	
						Red maple-----------	50	32	
						Black cherry--------	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Red pine------------	60	101	
						Bigtooth aspen------	74	86	
100B, 100D:									
Keweenaw-------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	61	38	Eastern white pine, red pine.
						Eastern hemlock-----	---	---	
						Yellow birch--------	---	---	
						Northern red oak----	64	57	
						Paper birch---------	60	65	
						Red maple-----------	50	32	
						Black cherry--------	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Red pine------------	60	101	
						Bigtooth aspen------	74	86	
Karlin---------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch--------	---	---	
						Bigtooth aspen------	---	---	
						Northern red oak----	---	---	
						American basswood---	---	---	
						Red pine------------	65	115	
						Eastern white pine--	---	---	
101B:									
Trenary--------	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	61	38	White spruce, red pine, eastern white pine.
						American basswood---	65	59	
						Yellow birch--------	61	38	
						American beech------	---	---	
						Quaking aspen-------	---	---	
						Balsam fir----------	---	---	
						Eastern hemlock-----	---	---	
Solona---------	3W	Slight	Severe	Slight	Moderate	Sugar maple---------	64	40	Eastern white pine, white ash, white spruce.
						Northern red oak----	---	---	
						White ash-----------	---	---	
						American basswood---	---	---	
102B---------- Escanaba	3S	Slight	Moderate	Moderate	Slight	Sugar maple---------	60	38	Red pine, white spruce.
						Basswood------------	---	---	
						Red maple-----------	---	---	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Eastern white pine--	75	166	
						Red pine------------	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
103B, 103D:									
Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Sarona	3L	Slight	Moderate	Slight	Slight	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
104A, 104B, 104D- Stambaugh	3L	Slight	Moderate	Slight	Slight	Sugar maple	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Red maple	---	---	
						Balsam fir	---	---	
105D:									
Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Rock outcrop.									
106D- Champion	3W	Slight	Severe	Slight	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						American basswood	---	---	
						Yellow birch	60	38	
						Eastern hemlock	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Bigtooth aspen	---	---	
						Black cherry	---	---	
						Eastern hophornbeam	---	---	
						White spruce	---	---	
						American elm	---	---	
107B, 107D- Sarona	3L	Slight	Moderate	Slight	Slight	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
107F- Sarona	3R	Slight	Moderate	Slight	Slight	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
108D:									
Sarona	3L	Slight	Moderate	Slight	Slight	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
Rock outcrop.									
108F:									
Sarona	3R	Moderate	Moderate	Slight	Slight	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
Rock outcrop.									
110B, 110D:									
Petticoat	3L	Slight	Moderate	Slight	Slight	Sugar maple	66	41	Red maple, white spruce, eastern white pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Black cherry	---	---	
						Paper birch	---	---	
						Red maple	---	---	
						American elm	---	---	
Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
111B:									
Champion	3W	Slight	Severe	Slight	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						American basswood	---	---	
						Yellow birch	60	38	
						Eastern hemlock	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Bigtooth aspen	---	---	
						Black cherry	---	---	
						Eastern hophornbeam	---	---	
						White spruce	---	---	
						American elm	---	---	
Net	3W	Slight	Severe	Moderate	Severe	Red maple	60	38	White spruce, eastern white pine.
						Balsam fir	58	113	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
						White spruce	49	94	
						Paper birch	53	53	
						Yellow birch	---	---	
						Eastern hemlock	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
112B, 112D--- Sundog	2L	Slight	Moderate	Slight	Slight	Red maple	53	34	Red pine, white spruce.
						Eastern hemlock	---	---	
						Quaking aspen	65	73	
						Sugar maple	---	---	
						Red pine	75	142	
						Balsam fir	---	---	
112F--- Sundog	2R	Moderate	Moderate	Slight	Slight	Red maple	53	34	Red pine, white spruce.
						Eastern hemlock	---	---	
						Quaking aspen	65	73	
						Sugar maple	---	---	
						Red pine	75	142	
						Balsam fir	---	---	
113A--- Sundog	4L	Slight	Moderate	Slight	Slight	Black spruce	50	65	Red pine, white spruce.
						Balsam fir	53	102	
						Quaking aspen	73	85	
						Red pine	---	---	
						Red maple	50	32	
						Eastern hemlock	---	---	
114A:									
Minocqua---	7W	Slight	Severe	Severe	Severe	Balsam fir	54	105	Red maple, white ash, white spruce, black spruce.
						Red maple	55	35	
						White ash	---	---	
						Black ash	---	---	
						Tamarack	55	50	
						Northern whitecedar-	---	---	
						Quaking aspen	---	---	
Channing---	2W	Slight	Severe	Moderate	Severe	Red maple	55	35	White spruce, eastern white pine.
						Quaking aspen	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
						Black spruce	---	---	
						White spruce	---	---	
						Northern whitecedar-	---	---	
						Yellow birch	---	---	
115A--- Manitowish	3S	Slight	Slight	Moderate	Slight	Sugar maple	60	38	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Quaking aspen	---	---	
						Eastern white pine--	---	---	
116B, 116D--- Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood---	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
121B--- Peavy	3W	Slight	Moderate	Slight	Moderate	Sugar maple	69	42	Red pine, white spruce.
						Yellow birch	---	---	
						Northern whitecedar-	---	---	
						American basswood---	---	---	
						Bigtooth aspen	---	---	
						Eastern white pine--	---	---	
						Eastern hemlock	---	---	
						American elm	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
121D---------- Peavy	3D	Slight	Moderate	Slight	Moderate	Sugar maple---------	69	42	Red pine, white spruce.
						Yellow birch--------	---	---	
						Northern whitecedar-	---	---	
						American basswood---	---	---	
						Bigtooth aspen------	---	---	
						Eastern white pine--	---	---	
						Eastern hemlock-----	---	---	
						American elm--------	---	---	
122B, 122D:									
Sarona---------	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	64	40	Red pine,
						Northern red oak----	72	69	eastern white
						American basswood---	70	66	pine, white
						Quaking aspen-------	---	---	spruce.
						White ash-----------	75	73	
Karlin---------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	61	38	Red pine,
						Yellow birch--------	---	---	eastern white
						Bigtooth aspen------	---	---	pine, jack
						Northern red oak----	---	---	pine.
						American basswood---	---	---	
						Red pine------------	65	115	
						Eastern white pine--	---	---	
123B, 123D------ Ocqueoc	3A	Slight	Slight	Slight	Slight	Sugar maple---------	63	39	Red pine, white spruce, eastern white pine.
						American beech------	---	---	
						Yellow birch--------	---	---	
						Quaking aspen-------	---	---	
						Eastern white pine--	---	---	
						Red pine------------	---	---	
						Jack pine-----------	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
124B, 125B:									
Wabeno---------	3L	Slight	Moderate	Slight	Moderate	Sugar maple---------	67	41	White spruce, red pine.
						American basswood---	74	72	
						Yellow birch--------	72	44	
						White ash-----------	78	78	
						Eastern hemlock-----	56	---	
Net------------	3W	Slight	Severe	Moderate	Severe	Red maple-----------	60	38	White spruce, eastern white pine.
						Balsam fir----------	58	113	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						White spruce--------	49	94	
						Paper birch---------	53	53	
						Yellow birch--------	---	---	
						Eastern hemlock-----	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
126B, 126D------ Champion	3W	Slight	Severe	Slight	Moderate	Sugar maple---------	60	38	White spruce, eastern white pine.
						American basswood---	---	---	
						Yellow birch--------	60	38	
						Eastern hemlock-----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Bigtooth aspen------	---	---	
						Black cherry--------	---	---	
						Eastern hophornbeam-	---	---	
						White spruce--------	---	---	
						American elm--------	---	---	
126F------------ Champion	3R	Moderate	Moderate	Slight	Moderate	Sugar maple---------	60	38	White spruce, eastern white pine.
						American basswood---	---	---	
						Yellow birch--------	60	38	
						Eastern hemlock-----	---	---	
						Balsam fir----------	---	---	
						Quaking aspen-------	---	---	
						Red maple-----------	---	---	
						Bigtooth aspen------	---	---	
						Black cherry--------	---	---	
						Eastern hophornbeam-	---	---	
						White spruce--------	---	---	
						American elm--------	---	---	
127D------------ Goodman	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
128B:									
Goodman---------	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	68	63	
						Bigtooth aspen------	---	---	
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
Wabeno----------	3L	Slight	Moderate	Slight	Moderate	Sugar maple---------	67	41	White spruce, red pine.
						American basswood---	74	72	
						Yellow birch--------	72	44	
						White ash-----------	78	78	
						Eastern hemlock-----	56	---	
Sundog----------	2L	Slight	Moderate	Slight	Slight	Red maple-----------	53	34	Red pine, white spruce, jack pine.
						Eastern hemlock-----	---	---	
						Quaking aspen-------	65	73	
						Sugar maple---------	---	---	
						Red pine------------	75	142	
						Balsam fir----------	---	---	
						White spruce--------	55	107	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
128D:									
Goodman	3L	Slight	Moderate	Slight	Slight	Sugar maple	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch	---	---	
						American basswood	68	63	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Sundog	2L	Slight	Moderate	Slight	Slight	Red maple	53	34	Red pine, white spruce.
						Eastern hemlock	---	---	
						Quaking aspen	65	73	
						Sugar maple	---	---	
						Red pine	75	142	
						Balsam fir	---	---	
128F:									
Goodman	3R	Slight	Moderate	Slight	Slight	Sugar maple	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch	---	---	
						American basswood	68	42	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
Sundog	2R	Moderate	Moderate	Slight	Slight	Red maple	53	34	Red pine, white spruce.
						Eastern hemlock	---	---	
						Quaking aspen	65	73	
						Sugar maple	---	---	
						Red pine	75	142	
						Balsam fir	---	---	
163B, 163D----- Sagola	4L	Slight	Moderate	Slight	Slight	Northern red oak	63	56	Red pine, white spruce, eastern white pine.
						Red maple	---	---	
						Paper birch	---	---	
163F---------- Sagola	4R	Moderate	Moderate	Slight	Slight	Northern red oak	63	56	Red pine, white spruce, eastern white pine.
						Red maple	---	---	
						Paper birch	---	---	
164B---------- Alstad	3W	Slight	Severe	Slight	Moderate	Red maple	65	40	Eastern white pine, white spruce, black spruce.
						American basswood	---	---	
						American elm	---	---	
						Quaking aspen	---	---	
						Northern red oak	64	57	
						Sugar maple	---	---	
						Bigtooth aspen	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
165B:									
Sundog	2L	Slight	Moderate	Slight	Slight	Red maple	53	34	Red pine, white spruce.
						Eastern hemlock	---	---	
						Quaking aspen	65	73	
						Sugar maple	---	---	
						Red pine	75	142	
						Balsam fir	---	---	
Channing	2W	Slight	Severe	Moderate	Severe	Red maple	55	35	White spruce, eastern white pine.
						Quaking aspen	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
						Black spruce	---	---	
						White spruce	---	---	
						Northern whitecedar	---	---	
						Yellow birch	---	---	
166F Soperton	3R	Moderate	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	44	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
167A Monico	3W	Slight	Moderate	Slight	Moderate	Sugar maple	63	39	White spruce, black spruce, eastern white pine, red maple, white ash.
						American basswood	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						White ash	---	---	
168F:									
Soperton	3R	Moderate	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Rock outcrop.									
500B, 500D Wabeno	3L	Slight	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
501F Soperton	3R	Moderate	Moderate	Slight	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
502B, 502D---------- Champion	3W	Slight	Severe	Slight	Moderate	Sugar maple----------	60	38	White spruce, eastern white pine.
						American basswood----	---	---	
						Yellow birch---------	60	38	
						Eastern hemlock------	---	---	
						Balsam fir-----------	---	---	
						Quaking aspen--------	---	---	
						Red maple------------	---	---	
						Bigtooth aspen-------	---	---	
						Black cherry---------	---	---	
						Eastern hophornbeam-	---	---	
						White spruce---------	---	---	
						American elm---------	---	---	
502F---------- Champion	3R	Moderate	Moderate	Slight	Moderate	Sugar maple----------	60	38	White spruce, eastern white pine.
						American basswood----	---	---	
						Yellow birch---------	60	38	
						Eastern hemlock------	---	---	
						Balsam fir-----------	---	---	
						Quaking aspen--------	---	---	
						Red maple------------	---	---	
						Bigtooth aspen-------	---	---	
						Black cherry---------	---	---	
						Eastern hophornbeam-	---	---	
						White spruce---------	---	---	
						American elm---------	---	---	
503A---------- Typic Fragiaquods	2W	Slight	Severe	Moderate	Severe	Sugar maple----------	50	32	Eastern white pine, white spruce.
						Red maple------------	55	35	
						Yellow birch---------	55	35	
						American elm---------	55	---	
						Black ash------------	50	32	
						Eastern hemlock------	---	---	
						Quaking aspen--------	---	---	
504B, 504D---------- Pence	3A	Slight	Slight	Slight	Slight	Sugar maple----------	59	37	Red pine, eastern white pine, jack pine.
						Red pine------------	59	84	
						Eastern white pine---	57	112	
						American basswood----	---	---	
						Balsam fir-----------	---	---	
						Quaking aspen--------	---	---	
						Paper birch----------	---	---	
						Yellow birch---------	---	---	
504F---------- Pence	3R	Moderate	Moderate	Slight	Slight	Sugar maple----------	59	37	Red pine, eastern white pine, jack pine.
						Red pine------------	59	99	
						Eastern white pine---	57	112	
						American basswood----	---	---	
						Balsam fir-----------	---	---	
						Quaking aspen--------	---	---	
						Paper birch----------	---	---	
						Yellow birch---------	---	---	
505, 506---------- Humaquepts	---	Slight	Severe	Severe	Severe	---	---	---	---

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
507A---------- Monico	3W	Slight	Moderate	Slight	Moderate	Sugar maple---------	63	39	White spruce, black spruce, eastern white pine, red maple, white ash.
						American basswood---	---	---	
						Yellow birch--------	---	---	
						Red maple-----------	---	---	
						White ash-----------	---	---	
508A---------- Beechwood	2W	Slight	Severe	Moderate	Moderate	Sugar maple---------	50	32	White spruce, eastern white pine.
						White spruce--------	60	118	
						Yellow birch--------	60	38	
						Red maple-----------	60	38	
509A---------- Typic Dystrochrepts	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	66	41	Tamarack, eastern white pine.
						American basswood---	---	---	
						Quaking aspen-------	---	---	
510---------- Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---
511B, 511D------ Typic Dystrochrepts	9L	Slight	Moderate	Slight	Slight	Red pine------------	70	128	Red pine, jack pine, northern red oak.
						Sugar maple---------	---	---	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						Jack pine-----------	---	---	
511F---------- Typic Dystrochrepts	9R	Moderate	Moderate	Slight	Slight	Red pine------------	70	128	Red pine, jack pine, northern red oak.
						Sugar maple---------	---	---	
						Northern red oak----	---	---	
						Quaking aspen-------	---	---	
						Jack pine-----------	---	---	
512---------- Borosaprists	---	Slight	Severe	Severe	Severe	Black spruce--------	---	---	---
						Tamarack------------	---	---	
513B---------- Entic Haplorthods	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	66	41	Red pine, white spruce.
						Red maple-----------	61	38	
						Yellow birch--------	66	41	
						Quaking aspen-------	75	87	
						American basswood---	71	67	
514B---------- Stambaugh	3L	Slight	Moderate	Slight	Slight	Sugar maple---------	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch--------	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						Eastern white pine--	---	---	
						Red maple-----------	---	---	
						Balsam fir----------	---	---	
515---------- Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---
517B, 517D------ Lode	7L	Slight	Moderate	Slight	Slight	Jack pine-----------	70	103	Jack pine, red pine.
						Red pine------------	70	128	
						White spruce--------	65	129	
						Sugar maple---------	60	38	
						Red maple-----------	65	40	
						Quaking aspen-------	65	73	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
517F---------- Lode	7R	Moderate	Moderate	Slight	Slight	Jack pine----------	70	103	Jack pine, red pine.
						Red pine----------	70	128	
						White spruce--------	65	129	
						Sugar maple---------	60	38	
						Red maple----------	65	40	
						Quaking aspen-------	65	73	
518---------- Humaquepts	---	Slight	Severe	Severe	Severe	---	---	---	---
519A---------- Monico	5W	Slight	Severe	Slight	Moderate	Quaking aspen-------	65	73	---
						Black spruce--------	---	---	
						White spruce--------	---	---	
						Red maple----------	---	---	
						Eastern white pine--	---	---	
						Balsam fir----------	---	---	
						Black ash----------	---	---	
						Eastern hemlock	---	---	
521B---------- Pence	9A	Slight	Slight	Slight	Slight	Jack pine----------	70	103	Red pine, eastern white pine, jack pine.
						Quaking aspen-------	65	73	
522D: Entic Fragiorthods--	8W	Slight	Severe	Slight	Moderate	Balsam fir----------	55	107	White spruce, black spruce, tamarack.
						Red maple----------	50	32	
						Quaking aspen-------	---	---	
						Bigtooth aspen------	---	---	
Typic Dystrochrepts.									
523B: Entic Haplorthods.									
Typic Haplaquepts---	---	Slight	Severe	Severe	Severe	---	---	---	---
525B---------- Entic Haplorthods	3F	Slight	Severe	Slight	Slight	Sugar maple---------	63	39	Red pine.
						American basswood---	---	---	
						Red maple----------	---	---	
						Quaking aspen-------	---	---	
525D---------- Entic Haplorthods	3R	Moderate	Severe	Slight	Slight	Sugar maple---------	63	39	Red pine.
						American basswood---	---	---	
						Red maple----------	---	---	
						Quaking aspen-------	---	---	
525F---------- Entic Haplorthods	3R	Severe	Severe	Slight	Slight	Sugar maple---------	63	39	Red pine.
						American basswood---	---	---	
						Red maple----------	---	---	
						Quaking aspen-------	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
527:									
Borohemists	---	Slight	Severe	Severe	Severe	---	---	---	---
Borosaprists	---	Slight	Severe	Severe	Severe	Black spruce	---	---	---
						Tamarack	---	---	
528: Borohemists	---	Slight	Severe	Severe	Severe	---	---	---	---
529: Borohemists	---	Slight	Severe	Severe	Severe	---	---	---	---
530:									
Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---
Histic Humaquepts	---	Slight	Severe	Severe	Severe	---	---	---	---
531C: Champion	3W	Slight	Severe	Slight	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						American basswood	---	---	
						Yellow birch	60	38	
						Eastern hemlock	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Bigtooth aspen	---	---	
						Black cherry	---	---	
						Eastern hophornbeam	---	---	
						White spruce	---	---	
						American elm	---	---	
532F: Champion	3R	Moderate	Moderate	Slight	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						American basswood	---	---	
						Yellow birch	60	38	
						Eastern hemlock	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Red maple	---	---	
						Bigtooth aspen	---	---	
						Black cherry	---	---	
						Eastern hophornbeam	---	---	
						White spruce	---	---	
						American elm	---	---	
Haplorthods.									
533B: Entic Fragiorthods	8W	Slight	Severe	Slight	Moderate	Balsam fir	55	107	White spruce, black spruce, tamarack.
						Red maple	50	32	
						Quaking aspen	---	---	
						Bigtooth aspen	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
534B, 534D--- Entic Haplorthods	6A	Slight	Slight	Slight	Slight	Bigtooth aspen	75	87	Red pine, jack pine.
						Red pine	68	123	
						Jack pine	70	103	
						Red maple	---	---	
						Northern red oak	---	---	
						Balsam fir	---	---	
						Eastern white pine	---	---	
						Paper birch	---	---	
535B, 535D--- Vilas	6A	Slight	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
536F--- Entic Haplorthods	3R	Severe	Severe	Slight	Slight	Sugar maple	63	39	Red pine.
						American basswood	---	---	
						Red maple	---	---	
539B--- Karlin	3A	Slight	Slight	Slight	Slight	Northern red oak	55	42	Jack pine.
						Red maple	---	---	
						Eastern white pine	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
540B: Entic Fragiorthods. Typic Fragiaquods.									
Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---
541--- Fluvaquents	---	Slight	Severe	Severe	Severe	---	---	---	---
542B, 542D--- Gogebic	3W	Slight	Severe	Moderate	Severe	Sugar maple	59	37	White spruce, eastern white pine, jack pine.
						Yellow birch	58	37	
						American basswood	67	61	
						Eastern hemlock	---	---	
						Balsam fir	61	120	
542F--- Gogebic	3R	Moderate	Moderate	Moderate	Moderate	Sugar maple	59	37	White spruce, eastern white pine, jack pine, red pine.
						Yellow birch	58	37	
						American basswood	67	61	
						Eastern hemlock	---	---	
						Balsam fir	61	120	
548: Humaquepts	---	Slight	Severe	Severe	Severe	---	---	---	---
Terric Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
549B, 549D:									
Karlin	3A	Slight	Slight	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
Pence	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
549F:									
Karlin	3R	Moderate	Moderate	Slight	Slight	Sugar maple	61	38	Red pine, eastern white pine, jack pine.
						Yellow birch	---	---	
						Bigtooth aspen	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Red pine	65	115	
						Eastern white pine	---	---	
Pence	3R	Moderate	Moderate	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
550, Terric Borosaprists	---	Slight	Severe	Severe	Severe	---	---	---	---
552F, Kalkaska	3R	Moderate	Moderate	Moderate	Slight	Sugar maple	72	44	Red pine.
						Red pine	---	---	
						Eastern white pine	---	---	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
553D, Kalkaska	3A	Slight	Slight	Slight	Slight	Sugar maple	64	40	Red pine.
						Quaking aspen	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Paper birch	---	---	
						Northern red oak	---	---	
						Red maple	63	39	
						Bigtooth aspen	80	95	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
554B---------- Alfic Fragiorthods	3W	Slight	Severe	Moderate	Moderate	Sugar maple--------- Quaking aspen------- American basswood--- Yellow birch--------	64 75 65 65	40 87 59 40	Red pine, white spruce, eastern white pine.
556---------- Haplaquods	---	Slight	Severe	Severe	Severe	---	---	---	---

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked unmanaged stands.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
51:							
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Humaquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
52:							
Greenwood	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Merwin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
53:							
Waucedah	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
55A, 55B Oconto	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
55D Oconto	Slight	Severe: slope.	Slight	Year round	Slight	Severe: slope.	Slight.
57A, 57B Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Spring, fall, winter.	Slight	Slight	Slight.
57D Padus	Moderate: low strength.	Moderate: slope.	Moderate: low strength.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
57F Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
58B---------- Trenary	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
58D---------- Trenary	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
59A---------- Solona	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
60D: Trenary----------	Moderate: low strength, rock outcrop.	Moderate: slope, low strength, rock outcrop.	Moderate: low strength, rock outcrop.	Summer, fall, winter.	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.
Rock outcrop.							
64A---------- Channing	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
65---------- Witbeck	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Moderate: too stony.	Moderate: too stony.
67B---------- Net	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Moderate: too stony.	Moderate: too stony.
68B: Net----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Moderate: too stony.	Moderate: too stony.
Witbeck----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Moderate: too stony.	Moderate: too stony.
69A: Karlin----------	Slight---------	Slight---------	Slight---------	Year round-----	Slight---------	Slight---------	Slight.
Croswell----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
70B: Sundog----------	Moderate: low strength, rock outcrop.	Moderate: low strength, rock outcrop.	Moderate: low strength, rock outcrop.	Summer, fall, winter.	Moderate: rock outcrop.	Moderate: rock outcrop.	Moderate: rock outcrop.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
70B:							
Channing	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Moderate: rock outcrop.	Moderate: rock outcrop.	Moderate: rock outcrop.
71D:							
Karlin	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.	Year round	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.
Vilas	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.	Year round	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.
Rock outcrop.							
72B Karlin	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
72D Karlin	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
72F Karlin	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
73A Gaastra	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight	Slight	Slight.
74A Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight	Slight	Slight.
75 Kinross	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
77B Vilas	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
78B:							
Vilas	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
Karlin	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
78D:							
Vilas	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
Karlin	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
78F:							
Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
Karlin	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
79A, 79B Fence	Severe: low strength.	Severe: low strength.	Severe: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
79D Fence	Severe: low strength.	Severe: low strength.	Severe: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
80B Pence	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
80D Pence	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
80F Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
82B Keweenaw	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
82D Keweenaw	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
82F Keweenaw	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
100B:							
Keweenaw	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
Karlin	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
100D:							
Keweenaw	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
Karlin	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
101B:							
Trenary	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Solona	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight	Slight	Slight.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
102B---------- Escanaba	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
103B:							
Wabeno----------	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
Sarona----------	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
103D:							
Wabeno----------	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
Sarona----------	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
104A, 104B---------- Stambaugh	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
104D---------- Stambaugh	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
105D:							
Wabeno----------	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
Rock outcrop.							
106D---------- Champion	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
107B---------- Sarona	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
107D---------- Sarona	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
107F---------- Sarona	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
108D:							
Sarona	Moderate: low strength, rock outcrop.	Moderate: low strength, slope, rock outcrop.	Moderate: low strength, rock outcrop.	Summer, fall, winter.	Moderate: rock outcrop.	Moderate: slope, rock outcrop.	Moderate: rock outcrop.
Rock outcrop.							
110B:							
Petticoat	Moderate: low strength.	Moderate: low strength, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: too stony.	Moderate: too stony.
Wabeno	Moderate: low strength.	Moderate: low strength, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: too stony.	Moderate: too stony.
110D:							
Petticoat	Moderate: low strength.	Moderate: low strength, slope, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: slope, too stony.	Moderate: too stony.
Wabeno	Moderate: low strength.	Moderate: low strength, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: slope, too stony.	Moderate: too stony.
111B:							
Champion	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
Net	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
112B	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Sundog							
112D	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength,	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
Sundog							
112F	Severe: slope.	Severe: slope.	Severe: slope.	Summer, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
Sundog							
113A	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Sundog							

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
114A:							
Minocqua	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
Channing	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight	Slight	Slight.
115A Manitowish	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
116B Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
116D Wabeno	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
121B Peavy	Moderate: wetness, low strength.	Moderate: wetness, low strength.	Moderate: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
121D Peavy	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, winter	Slight	Moderate: slope.	Slight.
122B:							
Sarona	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Karlin	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
122D:							
Sarona	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
Karlin	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate:	Slight.
123B Ocqueoc	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
123D Ocqueoc	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
124B:							
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Net	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: too stony.	Moderate: too stony.
125B:							
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Net	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: too stony.	Moderate: too stony.
126B Champion	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
126D Champion	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: slope.	Slight.
126F Champion	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
127D Goodman	Moderate: low strength.	Moderate: low strength, slope, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: slope, too stony.	Moderate: too stony.
128B:							
Goodman	Moderate: low strength.	Moderate: low strength, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: too stony.	Moderate: too stony.
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
Sundog	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
128D:							
Goodman	Moderate: low strength.	Moderate: low strength, slope, too stony.	Moderate: low strength, too stony.	Summer, fall, winter.	Slight	Moderate: slope, too stony.	Moderate: too stony.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
128D:							
Wabeno	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
Sundog	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
128F:							
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Year round	Severe: slope.	Severe: slope.	Severe: slope.
Sundog	Severe: slope.	Severe: slope.	Severe: slope.	Year round	Severe: slope.	Severe: slope.	Severe: slope.
500B Wabeno	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
500D Wabeno	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: slope.	Slight.
501F Soperton	Severe: wetness, low strength.	Severe: slope.	Severe: wetness, low strength.	Summer, winter	Slight	Severe: slope.	Slight.
502B Champion	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
502D Champion	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Moderate: slope.	Slight.
502F Champion	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
503A Typic Fragiaquods	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
504B Pence	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
504D Pence	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
504F Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
505, 506---------- Humaquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight---------	Slight---------	Slight.
507A---------- Monico	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Slight---------	Slight.
508A---------- Beechwood	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Slight---------	Slight.
509A---------- Typic Dystrochrepts	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
510---------- Borosaprists	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
511B---------- Typic Dystrochrepts	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
511D---------- Typic Dystrochrepts	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
511F---------- Typic Dystrochrepts	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
512---------- Borosaprists	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
513B---------- Entic Haplorthods	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
514B---------- Stambaugh	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.
515---------- Borosaprists	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
516B, 516D. Fragiorthods							
517B---------- Lode	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Slight---------	Slight.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
517D---------- Lode	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
517F---------- Lode	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
518---------- Humaquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight---------	Slight--------	Slight.
519A---------- Monico	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, fall, winter.	Slight---------	Slight--------	Slight.
520B. Haplorthods							
521B---------- Pence	Slight---------	Slight--------	Slight--------	Year round-----	Slight---------	Slight--------	Slight.
522D: Entic Fragiorthods------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight---------	Moderate: slope.	Slight.
Typic Dystrochrepts.							
523B: Entic Haplorthods.							
Typic Haplaquepts--	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight---------	Slight--------	Slight.
524D, 524F. Haplorthods							
525B---------- Entic Haplorthods	Slight---------	Severe: too cobbly.	Severe: too cobbly.	Year round-----	Slight---------	Severe: too cobbly.	Severe: too cobbly.
525D---------- Entic Haplorthods	Moderate: slope.	Severe: slope, too cobbly.	Severe: too cobbly.	Year round-----	Moderate: slope.	Severe: slope, too cobbly.	Severe: too cobbly.
525F---------- Entic Haplorthods	Severe: slope.	Severe: slope, too cobbly.	Severe: too cobbly, slope.	Year round-----	Severe: slope.	Severe: too cobbly, slope.	Severe: too cobbly, slope.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
527:							
Borohemists	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Borosaprists	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
528, 529---------- Borohemists	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
530:							
Borosaprists	Severe: low strength, wetness.	Severe: low strength, wetness.	Severe: low strength, wetness.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Histic Humaquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
531C---------- Champion	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: slope.	Slight.
532F:							
Champion	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: slope.	Severe: slope.	Moderate: slope.
Haplorthods.							
533B---------- Entic Fragiorthods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight	Slight	Slight.
534B---------- Entic Haplorthods	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
534D---------- Entic Haplorthods	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
535B---------- Vilas	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
535D---------- Vilas	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
536F---------- Entic Haplorthods	Severe: slope.	Severe: slope.	Severe: slope.	Year round	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
537B. Haplorthods							
538B, 538D. Entic Haplorthods							
539B---------- Karlin	Slight---------	Slight--------	Slight--------	Year round-----	Slight---------	Slight--------	Slight.
540B: Entic Fragiorthods.							
Typic Fragiaquods.							
Borosaprists-------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
541---------- Fluvaquents	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Slight--------	Slight.
542B---------- Gogebic	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Slight--------	Slight.
542D---------- Gogebic	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Moderate: slope.	Slight.
542F---------- Gogebic	Severe: wetness, low strength.	Severe: wetness, low strength, slope.	Severe: wetness, low strength.	Summer, winter	Moderate: slope.	Severe: slope.	Moderate: slope.
543A---------- Haplaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight---------	Slight--------	Slight.
544C, 544D, 544F. Haplorthods							
545B, 545D, 545F. Haplorthods							
546C, 546D, 546F. Entic Haplorthods							
547B. Haplorthods							

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
548: Humaquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight	Slight	Slight.
Terric Borosaprists	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Moderate: low strength.	Slight.
549B: Karlin	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
Pence	Slight	Slight	Slight	Year round	Slight	Slight	Slight.
549D: Karlin	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
Pence	Slight	Moderate: slope.	Slight	Year round	Slight	Moderate: slope.	Slight.
549F: Karlin	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Year round	Moderate: slope.	Severe: slope.	Moderate: slope.
550--- Terric Borosaprists	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
551A. Typic Fragiorthods							
552F--- Kalkaska	Moderate: slope, too sandy.	Severe: slope.	Moderate: slope, too sandy.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
553D--- Kalkaska	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
554B--- Alfic Fragiorthods	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
555B. Entic Haplorthods							

TABLE 9.--EQUIPMENT LIMITATIONS ON WOODLAND--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid trails	Landings	Logging roads		Logging areas and skid trails	Landings	Logging roads
556---------- Haplaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, fall, winter.	Slight---------	Slight---------	Slight.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(Only the soils likely to be used for windbreaks and environmental plantings are listed. The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
55A, 55B, 55D----- Oconto	Lilac, Siberian peashrub, eastern redcedar, American cranberrybush, Amur maple, gray dogwood, silky dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
57A, 57B---------- Padus	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce---------	Jack pine, red pine, eastern white pine.	---
64A---------- Channing	American cranberrybush, lilac, silky dogwood, Roselow sargent crabapple, nannyberry viburnum, Amur maple.	White spruce, northern whitecedar, Siberian crabapple.	Norway spruce, eastern white pine, green ash.	---
69A:				
Karlin----------	Siberian peashrub, lilac, staghorn sumac, eastern redcedar, smooth sumac.	Red pine, eastern white pine, jack pine, Austrian pine.	---	---
Croswell---------	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine---	Eastern white pine----	---
70B:				
Sundog----------	Eastern redcedar, Siberian peashrub, common ninebark, silver buffaloberry, lilac, Peking cotoneaster, Roselow sargent crabapple.	Eastern white pine, jack pine, green ash, Austrian pine, red pine.	---	---
Channing.				
71D:				
Karlin----------	Staghorn sumac, lilac, smooth sumac, eastern redcedar, Siberian peashrub.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
Vilas----------	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
Rock outcrop.				

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
72B, 72D, 72F----- Karlin	Lilac, staghorn sumac, eastern redcedar, Siberian peashrub, smooth sumac.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
73A---------- Gaastra	Northern whitecedar, Roselow sargent crabapple, American cranberrybush, nannyberry viburnum, silky dogwood, common ninebark, arrowwood.	White spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	---
74A---------- Au Gres	Silky dogwood, American cranberrybush, Amur maple, common ninebark, nannyberry viburnum.	White spruce, jack pine, Manchurian crabapple.	Norway spruce, green ash, eastern white pine.	Imperial Carolina poplar.
77B, 77D---------- Vilas	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
78B, 78D, 78F: Vilas----------	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
Karlin----------	Lilac, staghorn sumac, eastern redcedar, Siberian peashrub, smooth sumac.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
79A, 79B---------- Fence	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
79D---------- Fence	Northern whitecedar, lilac, silky dogwood, American cranberrybush, Amur maple, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, red maple, white ash.	---
80B, 80D, 80F----- Pence	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
82B, 82D, 82F----- Keweenaw	Lilac, northern whitecedar, Amur maple, Siberian peashrub, Peking cotoneaster.	Manchurian crabapple, white spruce, Norway spruce, jack pine.	Red pine, eastern white pine.	Imperial Carolina poplar.
100B, 100D: Keweenaw---------	Lilac, northern whitecedar, Amur maple, Siberian peashrub, Peking cotoneaster.	Manchurian crabapple, white spruce, Norway spruce, jack pine.	Red pine, eastern white pine.	Imperial Carolina poplar.
Karlin----------	Lilac, staghorn sumac, eastern redcedar, Siberian peashrub, smooth sumac.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
102B---------- Escanaba	Lilac, Amur maple, Siberian peashrub, common ninebark, Roselow sargent crabapple, nannyberry viburnum.	Norway spruce, jack pine, Manchurian crabapple, white spruce.	Eastern white pine, red pine.	---
104A---------- Stambaugh	Silky dogwood, Siberian crabapple, nannyberry viburnum, eastern redcedar, Amur privet, northern whitecedar, American cranberrybush.	White spruce, red pine, jack pine.	Eastern white pine----	---
104B, 104D-------- Stambaugh	Nannyberry viburnum, eastern redcedar, lilac, Amur maple, Siberian peashrub, silky dogwood, northern whitecedar, common ninebark.	Eastern white pine, red pine, green ash, jack pine.	---	---
112B, 112D, 112F, 113A---------- Sundog	Eastern redcedar, Siberian peashrub, common ninebark, silver buffaloberry, lilac, Peking cotoneaster, Roselow sargent crabapple.	Eastern white pine, jack pine, green ash, Austrian pine, red pine.	---	---
114A: Minocqua.				
Channing---------	American cranberrybush, lilac, silky dogwood, Roselow sargent crabapple, nannyberry viburnum, Amur maple.	White spruce, northern whitecedar, Siberian crabapple.	Norway spruce, eastern white pine, green ash.	---

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
115A---------- Manitowish	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
122B: Sarona----------	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
Karlin----------	Staghorn sumac, lilac, smooth sumac, eastern redcedar, Siberian peashrub.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
122D: Sarona.				
Karlin----------	Staghorn sumac, lilac, smooth sumac, eastern redcedar, Siberian peashrub.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
123B, 123D-------- Ocqueoc	Amur maple, eastern redcedar, Siberian peashrub, silky dogwood.	White spruce, Norway spruce, jack pine, green ash, red pine, Siberian crabapple.	Eastern white pine----	---
128B, 128D: Goodman.				
Wabeno.				
Sundog----------	Eastern redcedar, Siberian peashrub, common ninebark, silver buffaloberry, lilac, Peking cotoneaster, Roselow sargent crabapple.	Eastern white pine, jack pine, green ash, Austrian pine, red pine.	---	---
128F: Goodman.				
Sundog----------	Eastern redcedar, Siberian peashrub, common ninebark, silver buffaloberry, lilac, Peking cotoneaster, Roselow sargent crabapple.	Eastern white pine, jack pine, green ash, Austrian pine, red pine.	---	---

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
163B, 163D, 163F--Sagola	Northern whitecedar, arrowwood, common ninebark, silky dogwood, eastern redcedar.	White spruce, Siberian crabapple, Norway spruce, red maple.	Eastern white pine, red pine.	Imperial Carolina poplar.
164B--Alstad	Northern whitecedar, lilac, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, green ash, white ash, red maple, silver maple.	---
165B:				
Sundog	Eastern redcedar, Siberian peashrub, common ninebark, silver buffaloberry, lilac, Peking cotoneaster, Roselow sargent crabapple.	Eastern white pine, jack pine, green ash, Austrian pine, red pine.	---	---
Channing	American cranberrybush, lilac, silky dogwood, Roselow sargent crabapple, nannyberry viburnum, Amur maple.	White spruce, northern whitecedar, Siberian crabapple.	Norway spruce, eastern white pine, green ash.	---
167A--Monico	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, common ninebark, lilac, American cranberrybush.	White spruce	Red maple, eastern white pine, white ash, silver maple.	---
504B, 504D, 504F--Pence	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
507A--Monico	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, common ninebark, lilac, American cranberrybush.	White spruce	Red maple, eastern white pine, white ash, silver maple.	---
508A--Beechwood	Northern whitecedar, American cranberrybush, nannyberry viburnum, Roselow sargent crabapple, common ninebark.	White spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
514B---------- Stambaugh	Silky dogwood, Siberian crabapple, nannyberry viburnum, eastern redcedar, Amur privet, northern whitecedar, American cranberrybush.	White spruce, red pine, jack pine.	Eastern white pine----	---
519A---------- Monico	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, common ninebark, lilac, American cranberrybush.	White spruce----------	Red maple, eastern white pine, white ash, silver maple.	---
521B---------- Pence	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
535B, 535D-------- Vilas	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---
542B, 542D-------- Gogebic	Amur maple, nannyberry viburnum, redosier dogwood, American cranberrybush, lilac, northern whitecedar, common ninebark, silky dogwood.	White spruce, Siberian crabapple, Norway spruce, eastern white pine.	---	---
542F---------- Gogebic	Common ninebark, American cranberrybush, lilac, redosier dogwood, silky dogwood, Amur maple.	White spruce, eastern white pine, Siberian crabapple, Norway spruce, red pine.	Green ash----------	---
549B, 549D, 549F:				
Karlin----------	Lilac, staghorn sumac, eastern redcedar, Siberian peashrub, smooth sumac.	Red pine, jack pine, eastern white pine, Austrian pine.	---	---
Pence----------	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce---------	Eastern white pine, red pine, jack pine.	---

TABLE 11.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
50:					
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Histosols	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
51:					
Lupton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
52:					
Greenwood	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Merwin	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
53:					
Waucedah	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
Cathro	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
54. Pits					
55A Oconto	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
55B Oconto	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
55D Oconto	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
56. Pits and dumps					

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
57A Padus	Slight	Slight	Moderate: small stones.	Slight	Moderate: large stones, droughty.
57B Padus	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
57D Padus	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
57F Padus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
58B Trenary	Slight	Slight	Moderate: slope.	Slight	Slight.
58D Trenary	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
59A Solona	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
60D: Trenary	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Rock outcrop.					
64A Channing	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
65 Witbeck	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
67B Net	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, large stones.
68B: Net	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Witbeck	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humas, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
69A: Karlin	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Slight	Moderate: droughty.
Croswell	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
70B:					
Sundog	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones, droughty.
Channing	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: large stones, wetness.
71D:					
Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: large stones, droughty, slope.
Rock outcrop.					
72B---- Karlin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
72D---- Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
72F---- Karlin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
73A---- Gaastra	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
74A---- Au Gres	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
75---- Kinross	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
76---- Ensley	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
77B---- Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
77D---- Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
78B:					
Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
78B:					
Karlin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
78D:					
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
78F:					
Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Karlin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
79A---- Fence	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
79B---- Fence	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
79D---- Fence	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
80B---- Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
80D---- Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
80F---- Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
82B---- Keweenaw	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: large stones, droughty.
82D---- Keweenaw	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: large stones, droughty, slope.
82F---- Keweenaw	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
100B:					
Keweenaw	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: large stones, droughty.
Karlin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
100D:					
Keweenaw	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: large stones, droughty, slope.
Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
101B:					
Trenary	Slight	Slight	Moderate: slope.	Slight	Slight.
Solona	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
102B---------- Escanaba	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: large stones, droughty.
103B:					
Wabeno	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: small stones, slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Sarona	Slight	Slight	Moderate: slope, small stones.	Slight	Severe: large stones.
103D:					
Wabeno	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.	Severe: large stones.
104A---------- Stambaugh	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: large stones.
104B---------- Stambaugh	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: large stones.
104D---------- Stambaugh	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: large stones, slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
105D:					
Wabeno	Moderate: slope, large stones, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope, wetness.
Rock outcrop.					
106D Champion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness, slope.
107B Sarona	Slight	Slight	Moderate: slope, small stones.	Slight	Severe: large stones.
107D Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.	Severe: large stones.
107F Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
108D:					
Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Severe: large stones.
Rock outcrop.					
108F:					
Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Rock outcrop.					
109D Udorthents	Variable	Variable	Variable	Variable	Variable.
110B:					
Petticoat	Moderate: wetness.	Moderate: slope.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: large stones.
Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: small stones, slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
110D:					
Petticoat	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope, wetness.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
111B: Champion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Net	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, large stones.
112B Sundog	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
112D Sundog	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, droughty, slope.
112F Sundog	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
113A Sundog	Slight	Slight	Slight	Slight	Moderate: large stones.
114A: Minocqua	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Channing	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
115A Manitowish	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty, large stones.
116B Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: small stones, slope, wetness.	Moderate: wetness.	Moderate: large stones.
116D Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
121B Peavy	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: large stones, slope, small stones.	Moderate: wetness.	Moderate: large stones, wetness.
121D Peavy	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: large stones, slope.
122B: Sarona	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Karlin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
122D:					
Sarona	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.	Severe: large stones.
Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
123B	Moderate: percs slowly, too sandy.	Moderate: too sandy, percs slowly.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
123D	Moderate: slope, percs slowly.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
124B, 125B:					
Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: small stones. slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Net	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
126B	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: percs slowly, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
126D	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness, slope.
126F	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.
127D	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
128B:					
Goodman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Wabeno	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: small stones, slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Sundog	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
128D:					
Goodman	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
128D:					
Wabeno	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Sundog	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, droughty, slope.
128F:					
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Sundog	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
163B---- Sagola	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
163D---- Sagola	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
163F---- Sagola	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
164B---- Alstad	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
165B:					
Sundog	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Channing	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
166F---- Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
167A---- Monico	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
168F:					
Soperton	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
500B---- Wabeno	Moderate: wetness, percs slowly.	Moderate: percs slowly, wetness.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: large stones, wetness.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
500D---------- Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope, wetness.
501F---------- Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
502B---------- Champion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: percs slowly, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
502D---------- Champion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness, slope.
502F---------- Champion	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.
503A---------- Typic Fragiaquods	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
504B---------- Pence	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: large stones, droughty.
504D---------- Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: large stones, droughty, slope.
504F---------- Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
505, 506---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
507A---------- Monico	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
508A---------- Beechwood	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
509A---------- Typic Dystrochrepts	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
510---------- Borosaprists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
511B---------- Typic Dystrochrepts	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
511D---------- Typic Dystrochrepts	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
511F---------- Typic Dystrochrepts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
512---------- Borosaprists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
513B---------- Entic Haplorthods	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: large stones, droughty.
514B---------- Stambaugh	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Moderate: large stones.
515---------- Borosaprists	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: wetness, flooding, excess humus.
516B, 516D---------- Fragiorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
517B---------- Lode	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: large stones, droughty.
517D---------- Lode	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, droughty, slope.
517F---------- Lode	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
518---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
519A---------- Monico	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
520B---------- Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
521B---------- Pence	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: large stones, droughty.
522D: Entic Fragiorthods---	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness, droughty.
Typic Dystrochrepts--	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
523B: Entic Haplorthods----	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
Typic Haplaquepts----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
524D, 524F---------- Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
525B---------- Entic Haplorthods	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.	Severe: large stones.
525D---------- Entic Haplorthods	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
525F---------- Entic Haplorthods	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: large stones, slope.
527:					
Borohemists----------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Borosaprists---------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
528, 529---------- Borohemists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
530:					
Borosaprists---------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Histic Humaquepts----	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
531C---------- Champion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
532F:					
Champion----------	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.
Haplorthods----------	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
533B---------- Entic Fragiorthods	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness, droughty.
534B---------- Entic Haplorthods	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
534D---------- Entic Haplorthods	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
535B---------- Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
535D---------- Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
536F---------- Entic Haplorthods	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
537B---------- Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
538B, 538D---------- Entic Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
539B---------- Karlin	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
540B: Entic Fragiorthods---	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
Typic Fragiaquods----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Borosaprists---------	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
541---------- Fluvaquents	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
542B---------- Gogebic	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness.
542D---------- Gogebic	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness, slope.
542F---------- Gogebic	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.
543A---------- Haplaquods	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
544C, 544D, 544F------ Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
545B, 545D, 545F------ Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
546C, 546D, 546F------ Entic Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
547B---------- Haplorthods	Variable--------	Variable--------	Variable--------	Variable--------	Variable.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
548:					
Humaquepts	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Terric Borosaprists	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: wetness, flooding, excess humus.
549B:					
Karlin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
549D:					
Karlin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
549F:					
Karlin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
550 Terric Borosaprists	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: wetness, flooding, excess humus.
551A Typic Fragiorthods	Variable	Variable	Variable	Variable	Variable.
552F Kalkaska	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
553D Kalkaska	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
554B Alfic Fragiorthods	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: large stones, wetness.
555B Entic Haplorthods	Variable	Variable	Variable	Variable	Variable.
556 Haplaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 12.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
50: Aquents.										
Histosols.										
51: Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Cathro	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Humaquepts	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
52: Greenwood	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Merwin	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Very poor.	Very poor.	Good.
53: Waucedah	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
Cathro	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
54. Pits										
55A, 55B Oconto	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
55D Oconto	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
56. Pits and dumps										
57A, 57B Padus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
57D, 57F Padus	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
58B Trenary	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
58D Trenary	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
59A Solona	Very poor.	Poor	Good	Good	Good	Fair	Fair	Poor	Good	Fair.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
60D:										
Trenary	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop.										
64A---- Channing	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
65---- Witbeck	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
67B---- Net	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
68B:										
Net	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Witbeck	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
69A:										
Karlin	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Croswell	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
70B:										
Sundog	Fair	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Channing	Very poor.	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
71D:										
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
72B, 72D---- Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
72F---- Karlin	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
73A---- Gaastra	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
74A---- Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
75---- Kinross	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
76--Ensley	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
77B--Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
77D--Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
78B:										
Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
78D:										
Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
78F:										
Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Karlin	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
79A, 79B--Fence	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
79D--Fence	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
80B--Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
80D, 80F--Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
82B--Keweenaw	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
82D--Keweenaw	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
82F--Keweenaw	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
100B:										
Keweenaw	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
100D:										
Keweenaw	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
101B:										
Trenary	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Solona	Very poor.	Poor	Good	Good	Good	Fair	Fair	Poor	Good	Fair.
102B---------- Escanaba	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
103B, 103D:										
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
104A---------- Stambaugh	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
104B---------- Stambaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
104D---------- Stambaugh	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
105D:										
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
Rock outcrop.										
106D---------- Champion	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
107B, 107D, 107F--- Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
108D, 108F:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
109D. Udorthents										
110B:										
Petticoat	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
110D:										
Petticoat	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
111B:										
Champion	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Net	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
112B Sundog	Fair	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
112D Sundog	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
112F Sundog	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
113A Sundog	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
114A:										
Minocqua	Fair	Good	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Channing	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
115A Manitowish	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
116B, 116D Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
121B Peavy	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
121D Peavy	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
122B:										
Sarona	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
122D:										
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
123B Ocqueoc	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
123D---------- Ocqueoc	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
124B, 125B:										
Wabeno----------	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
Net----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
126B---------- Champion	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
126D---------- Champion	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
126F---------- Champion	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
127D---------- Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
128B:										
Goodman----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Poor	Very poor.
Wabeno----------	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
Sundog----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
128D:										
Goodman----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Poor	Very poor.
Wabeno----------	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
Sundog----------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
128F:										
Goodman----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Poor	Very poor.
Sundog----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163B---------- Sagola	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163D---------- Sagola	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163F---------- Sagola	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
164B---------- Alstad	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
165B: Sundog	Fair	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Channing	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
166F: Soperton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
167A: Monico	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
168F: Soperton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
500B, 500D: Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Poor	Poor	Good	Poor.
501F: Soperton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
502B: Champion	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
502D: Champion	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
502F: Champion	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
503A: Typic Fragiaquods	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
504B: Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
504D, 504F: Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
505, 506: Humaquepts	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
507A: Monico	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
508A: Beechwood	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
509A: Typic Dystrochrepts	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
510: Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
511B: Typic Dystrochrepts	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
511D---------- Typic Dystrochrepts	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
511F---------- Typic Dystrochrepts	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
512---------- Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
513B---------- Entic Haplorthods	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
514B---------- Stambaugh	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
515---------- Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
516B, 516D. Fragiorthods										
517B---------- Lode	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
517D---------- Lode	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
517F---------- Lode	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
518---------- Humaquepts	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
519A---------- Monico	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
520B. Haplorthods										
521B---------- Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
522D: Entic Fragiorthods	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Typic Dystrochrepts.										
523B: Entic Haplorthods.										
Typic Haplaquepts-	Poor	Fair	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
524D, 524F. Haplorthods										

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
525B, 525D, 525F--- Entic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
527:										
Borohemists-------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Borosaprists------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
528---------- Borohemists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
529---------- Borohemists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
530:										
Borosaprists------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Histic Humaquepts-	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
531C---------- Champion	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
532F:										
Champion----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Haplorthods.										
533B---------- Entic Fragiorthods	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
534B, 534D--------- Entic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
535B---------- Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
535D---------- Vilas	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
536F---------- Entic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
537B. Haplorthods										
538B, 538D. Entic Haplorthods										
539B---------- Karlin	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
540B: Entic Fragiorthods.										
Typic Fragiaquods.										

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
540B: Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
541--- Fluvaquents	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
542B--- Gogebic	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
542D--- Gogebic	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
542F--- Gogebic	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
543A. Haplaquods										
544C, 544D, 544F, 545B, 545D, 545F, 546C, 546D, 546F, 547B. Haplorthods										
548: Humaquepts	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
Terric Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
549B: Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
549D: Karlin	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
549F: Karlin	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
550--- Terric Borosaprists	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
551A. Typic Fragiorthods										

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
552F---------- Kalkaska	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
553D---------- Kalkaska	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
554B---------- Alfic Fragiorthods	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
555B. Entic Haplorthods										
556---------- Haplaquods	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

TABLE 13.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
50:						
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Histosols	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
51:						
Lupton	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
52:						
Greenwood	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Merwin	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
53:						
Waucedah	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding, excess humus.
Cathro	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding, excess humus.
54. Pits						
55A Oconto	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
55B Oconto	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
55D---------- Oconto	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
56. Pits and dumps						
57A---------- Padus	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty, small stones.
57B---------- Padus	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: large stones, droughty, small stones.
57D---------- Padus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
57F---------- Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
58B---------- Trenary	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
58D---------- Trenary	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
59A---------- Solona	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness, droughty.
60D: Trenary----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Rock outcrop.						
64A---------- Channing	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
65---------- Witbeck	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
67B---------- Net	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
68B: Net----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
68B: Witbeck	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
69A: Karlin	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
70B: Sundog	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
Channing	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: large stones, wetness.
71D: Karlin	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Rock outcrop.						
72B--- Karlin	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
72D--- Karlin	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
72F--- Karlin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
73A--- Gaastra	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
74A--- Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
75--- Kinross	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
76--- Ensley	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
77B---------- Vilas	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
77D---------- Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
78B: Vilas----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Karlin----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
78D: Vilas----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Karlin----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
78F: Vilas----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Karlin----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
79A---------- Fence	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
79B---------- Fence	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: frost action.	Slight.
79D---------- Fence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
80B---------- Pence	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
80D---------- Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
80F---------- Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
82B---------- Keweenaw	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
82D---------- Keweenaw	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
82F---------- Keweenaw	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
100B:						
Keweenaw---------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
Karlin----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
100D:						
Keweenaw---------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Karlin----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
101B:						
Trenary----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Solona----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.
102B---------- Escanaba	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
103B:						
Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Sarona----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
103D:						
Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
Sarona----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
104A---------- Stambaugh	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Moderate: large stones.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
104B---------- Stambaugh	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
104D---------- Stambaugh	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
105D: Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action, wetness.	Moderate: large stones, slope, wetness.
Rock outcrop.						
106D---------- Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
107B---------- Sarona	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
107D---------- Sarona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
107F---------- Sarona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
108D: Sarona----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Rock outcrop.						
108F: Sarona----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Rock outcrop.						
109D---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
110B: Petticoat--------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: frost action, wetness.	Moderate: large stones, wetness.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
110D:						
Petticoat	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Wabeno	Severe: cutbanks cave, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action, wetness.	Moderate: large stones, slope, wetness.
111B:						
Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Net	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	
112B Sundog	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
112D Sundog	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
112F Sundog	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
113A Sundog	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones.
114A:						
Minocqua	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Channing	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
115A Manitowish	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, large stones.
116B Wabeno	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: frost action, wetness.	Moderate: large stones, wetness.
116D Wabeno	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, frost action, wetness.	Moderate: large stones, slope, wetness.
121B Peavy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
121D--- Peavy	Moderate: dense layer, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
122B: Sarona---	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Moderate: frost action.	Moderate: large stones, droughty, small stones.
Karlin---	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
122D: Sarona---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
Karlin---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
123B--- Ocqueoc	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
123D--- Ocqueoc	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
124B, 125B: Wabeno---	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: frost action, wetness.	Moderate: large stones, wetness.
Net---	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
126B--- Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
126D--- Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, droughty.
126F--- Champion	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
127D--- Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
128B: Goodman---	Severe: cutbanks cave.	Slight---	Slight---	Moderate: slope.	Moderate: frost action.	Moderate: large stones.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
128B:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Sundog	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
128D:						
Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
Sundog	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
128F:						
Goodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sundog	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
163B--Sagola	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
163D--Sagola	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
163F--Sagola	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
164B--Alstad	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
165B:						
Sundog	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones, droughty.
Channing	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
166F--Soperton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
167A---------- Monico	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness, droughty.
168F: Soperton---------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
500B---------- Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: frost action, wetness.	Moderate: large stones, wetness, droughty.
500D---------- Wabeno	Severe: cutbanks cave, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action, wetness.	Moderate: large stones, droughty, wetness.
501F---------- Soperton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
502B---------- Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
502D---------- Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
502F---------- Champion	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
503A---------- Typic Fragiaquods	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
504B---------- Pence	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
504D---------- Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
504F---------- Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
505, 506---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
507A---------- Monico	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness, droughty.
508A---------- Beechwood	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
509A---------- Typic Dystrochrepts	Moderate: large stones, wetness.	Moderate: large stones.	Moderate: wetness, large stones.	Moderate: large stones.	Moderate: frost action, large stones.	Slight.
510---------- Borosaprists	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
511B---------- Typic Dystrochrepts	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
511D---------- Typic Dystrochrepts	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
511F---------- Typic Dystrochrepts	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
512---------- Borosaprists	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
513B---------- Entic Haplorthods	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
514B---------- Stambaugh	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
515---------- Borosaprists	Severe: excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding, excess humus.
516B, 516D-------- Fragiorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
517B---------- Lode	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
517D---------- Lode	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
517F---------- Lode	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
518---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
519A---------- Monico	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness, droughty.
520B---------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
521B---------- Pence	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
522D: Entic Fragiorthods----	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
Typic Dystrochrepts---	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
523B: Entic Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Typic Haplaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
524D, 524F-------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
525B---------- Entic Haplorthods	Severe: cutbanks cave, large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
525D, 525F-------- Entic Haplorthods	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
527: Borohemists------	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Borosaprists-----	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
528, 529---------- Borohemists	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
530: Borosaprists-----	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
530: Histic Humaquepts	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
531C---Champion	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
532F: Champion---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Haplorthods---	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
533B---Entic Fragiorthods	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
534B---Entic Haplorthods	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
534D---Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
535B---Vilas	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
535D---Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
536F---Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
537B---Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
538B, 538D---Entic Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
539B---Karlin	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
540B: Entic Fragiorthods---	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
Typic Fragiaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Borosaprists---	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
541--- Fluvaquents	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
542B--- Gogebic	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness, droughty.
542D--- Gogebic	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, droughty.
542F--- Gogebic	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
543A--- Haplaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
544C, 544D, 544F--- Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
545B, 545D, 545F--- Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
546C, 546D, 546F--- Entic Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
547B--- Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
548:						
Humaquepts---	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
Terric Borosaprists---	Severe: excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding, excess humus.
549B:						
Karlin---	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
Pence---	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: large stones, droughty.
549D:						
Karlin---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Pence---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
549F: Karlin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
550 Terric Borosaprists	Severe: excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding, excess humus.
551A Typic Fragiorthods	Variable	Variable	Variable	Variable	Variable	Variable.
552F Kalkaska	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
553D Kalkaska	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
554B Alfic Fragiorthods	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
555B Entic Haplorthods	Variable	Variable	Variable	Variable	Variable	Variable.
556 Haplaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
50:					
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
51:					
Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
52:					
Greenwood	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Merwin	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
53:					
Waucedah	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Cathro	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
54. Pits					
55A--- Oconto	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
55B---------- Oconto	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
55D---------- Oconto	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
56. Pits and dumps					
57A---------- Padus	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
57B, 57D---------- Padus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
57F---------- Padus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
58B---------- Trenary	Moderate: percs slowly.	Severe: seepage, slope.	Slight----------	Slight----------	Good.
58D---------- Trenary	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
59A---------- Solona	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
60D: Trenary----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Rock outcrop.					
64A---------- Channing	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
65---------- Witbeck	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: small stones, ponding.
67B---------- Net	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: small stones, wetness.
68B: Net----------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
68B:					
Witbeck	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: small stones, ponding.
69A:					
Karlin	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage.
Croswell	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
70B:					
Sundog	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Channing	Severe: wetness, poor filter.	Severe: seepage, wetness, large stones.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
71D:					
Karlin	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Rock outcrop.					
72B---- Karlin	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
72D---- Karlin	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
72F---- Karlin	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
73A---- Gaastra	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
74A---- Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
75---- Kinross	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
76---------- Ensley	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
77B---------- Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
77D---------- Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
78B:					
Vilas----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Karlin----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
78D:					
Vilas----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Karlin----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
78F:					
Vilas----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Karlin----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
79A, 79B---------- Fence	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
79D---------- Fence	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
80B---------- Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
80D---------- Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
80F---------- Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
82B---------- Keweenaw	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
82D---------- Keweenaw	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
82F---------- Keweenaw	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
100B: Keweenaw----------	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Karlin----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
100D: Keweenaw----------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Karlin----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
101B: Trenary----------	Moderate: percs slowly.	Severe: seepage.	Slight----------	Slight----------	Good.
Solona----------	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
102B---------- Escanaba	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
103B: Wabeno----------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Fair: small stones, wetness, thin layer.
Sarona----------	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight----------	Poor: seepage.
103D: Wabeno----------	Severe: wetness, percs slowly.	Severe: seepage, slope, wetness.	Severe: seepage, wetness.	Moderate: wetness, slope.	Fair: small stones, slope, wetness.
Sarona----------	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
104A---------- Stambaugh	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
104B---------- Stambaugh	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
104D---------- Stambaugh	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
105D: Wabeno----------	Severe: percs slowly, wetness.	Severe: slope, wetness, seepage.	Severe: seepage, wetness.	Moderate: slope, wetness.	Poor: seepage, small stones.
Rock outcrop.					
106D---------- Champion	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
107B---------- Sarona	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight----------	Poor: seepage.
107D---------- Sarona	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage.
107F---------- Sarona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: seepage, slope.
108D: Sarona----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage.
Rock outcrop.					
108F: Sarona----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: seepage, slope.
Rock outcrop.					
109D---------- Udorthents	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
110B: Petticoat----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
Wabeno----------	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Poor: seepage, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
110D: Petticoat	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Wabeno	Severe: percs slowly, wetness.	Severe: slope, wetness, seepage.	Severe: seepage, wetness.	Moderate: slope, wetness.	Poor: seepage, small stones.
111B: Champion	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
Net	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
112B Sundog	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
112D Sundog	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
112F Sundog	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
113A Sundog	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
114A: Minocqua	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.
Channing	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
115A Manitowish	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
116B Wabeno	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy, large stones.	Slight	Poor: seepage, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
116D---------- Wabeno	Severe: percs slowly.	Severe: slope.	Moderate: slope, too sandy, large stones.	Moderate: slope.	Poor: seepage, small stones.
121B---------- Peavy	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
121D---------- Peavy	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: small stones.
122B:					
Sarona----------	Moderate: percs slowly.	Moderate: seepage, slope, large stones.	Moderate: too sandy, large stones.	Slight----------	Poor: seepage, small stones.
Karlin----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
122D:					
Sarona----------	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage.
Karlin----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
123B---------- Ocqueoc	Severe: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
123D---------- Ocqueoc	Severe: percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
124B, 125B:					
Wabeno----------	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Poor: seepage, small stones.
Net----------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
126B---------- Champion	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
126D---------- Champion	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
126F---------- Champion	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, slope.
127D---------- Goodman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage, thin layer.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
128B:					
Goodman	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight	Poor: seepage, thin layer.
Wabeno	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Poor: seepage, small stones.
Sundog	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: thin layer.
128D:					
Goodman	Moderate: percs slowly, slope.	Severe: slope, seepage.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage, thin layer.
Wabeno	Severe: wetness, percs slowly.	Severe: seepage, slope, wetness.	Severe: seepage, wetness.	Moderate: wetness, slope.	Poor: seepage, small stones.
Sundog	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
128F:					
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: seepage, small stones, slope.
Sundog	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
163B--- Sagola	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
163D--- Sagola	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
163F--- Sagola	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, slope.
164B--- Alstad	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
165B:					
Sundog	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Channing	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
166F---------- Soperton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
167A---------- Monico	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
168F: Soperton----------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
Rock outcrop.					
500B---------- Wabeno	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Poor: seepage, small stones.
500D---------- Wabeno	Severe: percs slowly, wetness.	Severe: slope, wetness, seepage.	Severe: seepage, wetness.	Moderate: slope, wetness.	Poor: seepage, small stones.
501F---------- Soperton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
502B---------- Champion	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
502D---------- Champion	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: seepage, wetness.
502F---------- Champion	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, slope.
503A---------- Typic Fragiaquods	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: seepage, wetness.
504B---------- Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
504D---------- Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
504F---------- Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
505, 506---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
507A---------- Monico	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
508A---------- Beechwood	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
509A---------- Typic Dystrochrepts	Moderate: wetness, percs slowly, large stones.	Moderate: seepage, wetness, large stones.	Severe: wetness.	Moderate: wetness.	Poor: large stones.
510---------- Borosaprists	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
511B---------- Typic Dystrochrepts	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Fair: small stones, thin layer.
511D---------- Typic Dystrochrepts	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: small stones, slope, thin layer.
511F---------- Typic Dystrochrepts	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
512---------- Borosaprists	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
513B---------- Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
514B---------- Stambaugh	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: thin layer, wetness.
515---------- Borosaprists	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
516B, 516D---------- Fragiorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
517B---------- Lode	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
517D---------- Lode	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
517F---------- Lode	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
518---------- Humaquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
519A---------- Monico	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
520B---------- Haplorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
521B---------- Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
522D: Entic Fragiorthods-	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
Typic Dystrochrepts	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
523B: Entic Haplorthods--	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
Typic Haplaquepts--	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
524D, 524F---------- Haplorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
525B---------- Entic Haplorthods	Severe: poor filter, large stones.	Severe: seepage, large stones.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, large stones.
525D, 525F---------- Entic Haplorthods	Severe: poor filter, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, large stones.
527: Borohemists--------	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
Borosaprists-------	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
528, 529---------- Borohemists	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
530:					
Borosaprists	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
Histic Humaquepts	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
531C---------- Champion	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Poor: seepage, wetness.
532F:					
Champion	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, slope.
Haplorthods	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
533B---------- Entic Fragiorthods	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
534B---------- Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: cemented pan, seepage.	Severe: seepage.	Poor: seepage, too sandy.
534D---------- Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: cemented pan, seepage.	Severe: seepage.	Poor: seepage, too sandy.
535B---------- Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
535D---------- Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
536F---------- Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
537B---------- Haplorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
538B, 538D---------- Entic Haplorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
539B---------- Karlin	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
540B:					
Entic Fragiorthods	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
Typic Fragiaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
540B: Borosaprists	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
541 Fluvaquents	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
542B Gogebic	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
542D Gogebic	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
542F Gogebic	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
543A Haplaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
544C, 544D, 544F Haplorthods	Variable	Variable	Variable	Variable	Variable.
545B, 545D, 545F Haplorthods	Variable	Variable	Variable	Variable	Variable.
546C, 546D, 546F Entic Haplorthods	Variable	Variable	Variable	Variable	Variable.
547B Haplorthods	Variable	Variable	Variable	Variable	Variable.
548: Humaquepts	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Terric Borosaprists	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
549B: Karlin	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
549D: Karlin	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
549D:					
Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
549F:					
Karlin	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
550 Terric Borosaprists	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
551A Typic Fragiorthods	Variable	Variable	Variable	Variable	Variable.
552F Kalkaska	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
553D Kalkaska	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
554B Alfic Fragiorthods	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: small stones, wetness.
555B Entic Haplorthods	Variable	Variable	Variable	Variable	Variable.
556 Haplaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

TABLE 15.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
50:				
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Histosols	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
51:				
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Humaquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
52:				
Greenwood	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Merwin	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
53:				
Waucedah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
54. Pits				
55A Oconto	Good	Probable	Probable	Poor: small stones, area reclaim.
55B, 55D Oconto	Good	Probable	Probable	Poor: small stones, area reclaim.
56. Pits and dumps				
57A, 57B, 57D Padus	Good	Probable	Probable	Poor: small stones, area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
57F Padus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
58B Trenary	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
58D Trenary	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
59A Solona	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
60D: Trenary	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Rock outcrop.				
64A Channing	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
65 Witbeck	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
67B Net	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
68B: Net	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
Witbeck	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
69A: Karlin	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones, thin layer.
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
70B:				
Sundog	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Channing	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
71D:				
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Rock outcrop.				
72B---- Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
72D---- Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
72F---- Karlin	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
73A---- Gaastra	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
74A---- Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
75---- Kinross	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
76---- Ensley	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
77B, 77D---- Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
78B:				
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
78D:				
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
78F:				
Vilas	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Karlin	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
79A, 79B Fence	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
79D Fence	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
80B, 80D Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
80F Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
82B, 82D Keweenaw	Good	Probable	Improbable: too sandy.	Poor: large stones, area reclaim.
82F Keweenaw	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, large stones, area reclaim.
100B:				
Keweenaw	Good	Probable	Improbable: too sandy.	Poor: large stones, area reclaim.
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
100D:				
Keweenaw	Good	Probable	Improbable: too sandy.	Poor: too sandy, large stones, area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
100D: Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
101B: Trenary	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Solona	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
102B--Escanaba	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, large stones.
103B, 103D: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
104A--Stambaugh	Fair: wetness.	Probable	Probable	Poor: area reclaim.
104B, 104D--Stambaugh	Good	Probable	Probable	Poor: area reclaim.
105D: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
Rock outcrop.				
106D--Champion	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
107B, 107D--Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
107F--Sarona	Poor: slope.	Probable	Probable	Poor: small stones, slope, area reclaim.
108D: Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
Rock outcrop.				

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
108F: Sarona	Poor: slope.	Probable	Probable	Poor: small stones, slope, area reclaim.
Rock outcrop.				
109D---- Udorthents	Variable	Variable	Variable	Variable.
110B: Petticoat	Fair: wetness.	Improbable	Probable	Poor: large stones, area reclaim.
Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
110D: Petticoat	Good	Improbable	Probable	Poor: large stones, area reclaim.
Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
111B: Champion	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
Net	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
112B, 112D---- Sundog	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
112F---- Sundog	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
113A---- Sundog	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
114A: Minocqua	Poor: wetness.	Probable	Probable	Poor: excess humus, small stones, area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
114A: Channing	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
115A Manitowish	Good	Probable	Probable	Poor: small stones, area reclaim, too sandy.
116B, 116D Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
121B Peavy	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
121D Peavy	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
122B: Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
122D: Sarona	Good	Probable	Probable	Poor: small stones.
Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
123B, 123D Ocqueoc	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
124B, 125B: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones.
Net	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
126B, 126D Champion	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
126F---------- Champion	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: small stones, area reclaim, slope.
127D---------- Goodman	Good----------	Probable----------	Probable----------	Poor: small stones.
128B: Goodman----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Wabeno----------	Fair: wetness.	Probable----------	Probable----------	Poor: small stones.
Sundog----------	Good----------	Probable----------	Improbable: too sandy.	Fair: small stones.
128D: Goodman----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Wabeno----------	Fair: wetness.	Probable----------	Probable----------	Poor: small stones.
Sundog----------	Good----------	Probable----------	Improbable: too sandy.	Fair: slope, small stones.
128F: Goodman----------	Poor: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
Sundog----------	Poor: slope.	Probable----------	Improbable: too sandy.	Poor: slope.
163B, 163D---------- Sagola	Good----------	Probable----------	Improbable: too sandy.	Poor: small stones.
163F---------- Sagola	Poor: slope.	Probable----------	Improbable: too sandy.	Poor: small stones, slope.
164B---------- Alstad	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
165B: Sundog----------	Good----------	Probable----------	Probable----------	Poor: too sandy, small stones, area reclaim.
Channing----------	Poor: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim, wetness.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
166F Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
167A Monico	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
168F: Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Rock outcrop.				
500B, 500D Wabeno	Fair: wetness.	Probable	Probable	Poor: large stones, area reclaim.
501F Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
502B, 502D Champion	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
502F Champion	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: small stones, area reclaim, slope.
503A Typic Fragiaquods	Poor: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, small stones, wetness.
504B, 504D Pence	Good	Probable	Probable	Poor: small stones, area reclaim.
504F Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, slope.
505, 506 Humaquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
507A Monico	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
508A Beechwood	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
509A---------- Typic Dystrochrepts	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
510---------- Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
511B, 511D---------- Typic Dystrochrepts	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
511F---------- Typic Dystrochrepts	Poor: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
512---------- Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
513B---------- Entic Haplorthods	Good----------	Probable----------	Improbable: too sandy.	Poor: small stones.
514B---------- Stambaugh	Fair: wetness.	Probable----------	Probable----------	Poor: area reclaim.
515---------- Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
516B, 516D---------- Fragiorthods	Variable----------	Variable----------	Variable----------	Variable.
517B, 517D---------- Lode	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
517F---------- Lode	Poor: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
518---------- Humaquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
519A---------- Monico	Fair: wetness.	Improbable: excess fines.	Improbable: too sandy.	Poor: small stones.
520B---------- Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
521B---------- Pence	Good----------	Probable----------	Probable----------	Poor: too sandy, small stones, area reclaim.
522D: Entic Fragiorthods---	Fair: wetness.	Probable----------	Improbable: too sandy.	Poor: area reclaim, small stones.
Typic Dystrochrepts--	Variable----------	Variable----------	Variable----------	Variable.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
523B:				
Entic Haplorthods	Variable	Improbable: excess fines.	Improbable: excess fines.	Variable.
Typic Haplaquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
524D, 524F Haplorthods	Variable	Variable	Variable	Variable.
525B, 525D Entic Haplorthods	Poor: large stones.	Improbable: large stones.	Improbable: too sandy, large stones.	Poor: too sandy, large stones, area reclaim.
525F Entic Haplorthods	Poor: large stones, slope.	Improbable: large stones.	Improbable: too sandy, large stones.	Poor: too sandy, large stones, area reclaim.
527:				
Borohemists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
528, 529 Borohemists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
530:				
Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Histic Humaquepts	Poor: thin layer, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
531C Champion	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
532F:				
Champion	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: small stones, area reclaim, slope.
Haplorthods	Variable	Variable	Variable	Variable.
533B Entic Fragiorthods	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, small stones.
534B, 534D Entic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
535B, 535D---------- Vilas	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
536F---------- Entic Haplorthods	Poor: slope.	Probable----------	Probable----------	Poor: too sandy, small stones, area reclaim.
537B---------- Entic Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
538B, 538D---------- Entic Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
539B---------- Karlin	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
540B:				
Entic Fragiorthods---	Variable----------	Variable----------	Variable----------	Variable.
Typic Fragiaquods----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Borosaprists---------	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
541---------- Fluvaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
542B, 542D---------- Gogebic	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
542F---------- Gogebic	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
543A---------- Haplaquods	Variable----------	Variable----------	Variable----------	Variable.
544C, 544D, 544F------ Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
545B, 545D, 545F------ Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
546C, 546D, 546F------ Entic Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
547B---------- Haplorthods	Variable----------	Variable----------	Variable----------	Variable.
548:				
Humaquepts----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Terric Borosaprists--	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
549B: Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, thin layer.
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
549D: Karlin	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
549F: Karlin	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
550 Terric Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
551A Typic Fragiorthods	Variable	Variable	Variable	Variable.
552F Kalkaska	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
553D Kalkaska	Good	Probable	Improbable: too sandy.	Poor: too sandy.
554B Alfic Fragiorthods	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
555B Entic Haplorthods	Variable	Variable	Variable	Variable.
556 Haplaquods	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 16.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
50:						
Aquents	Slight	Severe: ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
Histosols	Slight	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
51:						
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Humaquepts	Slight	Severe: ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
52:						
Greenwood	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
Merwin	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, subsides, frost action.	Ponding	Wetness.
53:						
Waucedah	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, flooding, frost action.	Ponding, soil blowing.	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, flooding, frost action.	Ponding, soil blowing.	Wetness.
54. Pits						
55A Oconto	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
55B Oconto	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
55D Oconto	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
56. Pits and dumps						

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
57A, 57B---------- Padus	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
57D, 57F---------- Padus	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty, rooting depth.
58B---------- Trenary	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing---	Rooting depth.
58D---------- Trenary	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, rooting depth.
59A---------- Solona	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness, erodes easily.	Erodes easily, wetness, droughty.
60D: Trenary----------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, rooting depth.
Rock outcrop.						
64A---------- Channing	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
65---------- Witbeck	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action, cutbanks cave.	Large stones, ponding.	Large stones, wetness, droughty.
67B---------- Net	Severe: seepage.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
68B: Net----------	Severe: seepage.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, frost action.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
Witbeck----------	Moderate: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action, cutbanks cave.	Large stones, ponding.	Large stones, wetness, droughty.
69A: Karlin----------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Droughty.
Croswell----------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy.	Droughty.
70B: Sundog----------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy, soil blowing.	Erodes easily, droughty.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
70B:						
Channing	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Large stones, wetness, too sandy.	Large stones, wetness, droughty.
71D:						
Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
Rock outcrop.						
72B--Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
72D, 72F--Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
73A--Gaastra	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
74A--Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Wetness, droughty.
75--Kinross	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, too sandy, soil blowing.	Wetness.
76--Ensley	Severe: seepage.	Severe: seepage, piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.
77B--Vilas	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
77D--Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
78B:						
Vilas	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
78D, 78F:						
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
79A, Fence	Slight	Severe: piping.	Severe: no water.	Frost action	Erodes easily, wetness.	Erodes easily.
79B, Fence	Moderate: slope.	Severe: piping.	Severe: no water.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
79D, Fence	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
80B, Pence	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
80D, 80F, Pence	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
82B, Keweenaw	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Large stones, too sandy, soil blowing.	Large stones, droughty.
82D, 82F, Keweenaw	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
100B:						
Keweenaw	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Large stones, too sandy, soil blowing.	Large stones, droughty.
Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
100D:						
Keweenaw	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
101B:						
Trenary	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Rooting depth.
Solona	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Erodes easily, wetness, soil blowing.	Erodes easily, wetness, droughty.
102B, Escanaba	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Large stones, soil blowing.	Large stones, droughty.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
103B:						
Wabeno	Severe: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Wetness, erodes easily.	Percs slowly, erodes easily, rooting depth.
Sarona	Moderate: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
103D:						
Wabeno	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Slope, wetness, erodes easily.	Rooting depth, slope, erodes easily.
Sarona	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
104A--- Stambaugh	Severe: seepage.	Severe: piping.	Severe: slow refill, cutbanks cave.	Favorable------	Erodes easily, wetness.	Erodes easily.
104B--- Stambaugh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
104D--- Stambaugh	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
105D:						
Wabeno	Severe: slope, seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Slope, wetness, erodes easily.	Rooting depth, slope, erodes easily.
Rock outcrop.						
106D--- Champion	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
107B--- Sarona	Moderate: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
107D, 107F--- Sarona	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
108D, 108F:						
Sarona	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Rock outcrop.						
109D--- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
110B:						
Petticoat	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Slope----------	Large stones, erodes easily, wetness.	Large stones, erodes easily.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
110B:						
Wabeno	Moderate: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Wetness, erodes easily.	Percs slowly, erodes easily, rooting depth.
110D:						
Petticoat	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Wabeno	Severe: slope, seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Slope, wetness, erodes easily.	Rooting depth, slope, erodes easily.
111B:						
Champion	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
Net	Severe: seepage.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
112B Sundog	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy, soil blowing.	Erodes easily, droughty.
112D Sundog	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
112F Sundog	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
113A Sundog	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Erodes easily, wetness, too sandy.	Erodes easily.
114A:						
Minocqua	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Erodes easily, ponding, too sandy.	Wetness, erodes easily.
Channing	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
115A Manitowish	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Too sandy, soil blowing.	Droughty.
116B Wabeno	Moderate: seepage, slope.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Wetness, erodes easily, rooting depth.	Rooting depth, erodes easily, percs slowly.
116D Wabeno	Severe: slope.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Slope, wetness, erodes easily.	Rooting depth, slope, erodes easily.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
121B--Peavy	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
121D--Peavy	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
122B:						
Sarona	Moderate: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, too sandy.	Large stones, droughty.
Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
122D:						
Sarona	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty.
Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
123B--Ocqueoc	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, too sandy, soil blowing.	Erodes easily, droughty.
123D--Ocqueoc	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
124B, 125B:						
Wabeno	Moderate: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Wetness, erodes easily, rooting depth.	Percs slowly, erodes easily, rooting depth.
Net	Severe: seepage.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, frost action.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
126B--Champion	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
126D--Champion	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
126F--Champion	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, droughty.
127D--Goodman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
128B:						
Goodman	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
128B:						
Wabeno	Severe: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Wetness, erodes easily, rooting depth.	Rooting depth, erodes easily, percs slowly.
Sundog	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, soil blowing.	Erodes easily.
128D:						
Goodman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Wabeno	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Percs slowly, slope.	Slope, wetness, erodes easily.	Rooting depth, slope, erodes easily.
Sundog	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, soil blowing.	Slope, erodes easily.
128F:						
Goodman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Sundog	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, soil blowing.	Slope, erodes easily.
163B Sagola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Large stones, too sandy, soil blowing.	Large stones, droughty.
163D, 163F Sagola	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
164B Alstad	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
165B:						
Sundog	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy, soil blowing.	Erodes easily, droughty.
Channing	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
166F Soperton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
167A Monico	Moderate: seepage.	Severe: seepage, piping.	Severe: no water.	Frost action---	Large stones, erodes easily, wetness.	Droughty, wetness, erodes easily.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
168F: Soperton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Rock outcrop.						
500B--- Wabeno	Moderate: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, large stone, slope.	Large stones, erodes easily, wetness.	Large stones, erodes easily, droughty.
500D--- Wabeno	Severe: slope, seepage.	Severe: seepage.	Severe: no water.	Percs slowly, large stone, slope.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
501F--- Soperton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
502B--- Champion	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
502D--- Champion	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
502F--- Champion	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, droughty.
503A--- Typic Fragiaquods	Moderate: seepage.	Severe: seepage, piping.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
504B--- Pence	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
504D, 504F--- Pence	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
505, 506--- Humaquepts	Slight---	Severe: ponding.	Slight---	Ponding, frost action.	Ponding---	Wetness.
507A--- Monico	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action---	Erodes easily, wetness.	Droughty, wetness, erodes easily.
508A--- Beechwood	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
509A--- Typic Dystrochrepts	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill, large stones.	Deep to water	Large stones, erodes easily.	Large stones, erodes easily.
510--- Borosaprists	Slight---	Severe: excess humus, ponding.	Slight---	Ponding, frost action.	Ponding, soil blowing.	Wetness.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
511B---------- Typic Dystrochrepts	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
511D, 511F-------- Typic Dystrochrepts	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope----------	Slope.
512---------- Borosaprists	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
513B---------- Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Too sandy, soil blowing.	Droughty.
514B---------- Stambaugh	Severe: seepage.	Severe: piping.	Severe: slow refill, cutbanks cave.	Slope----------	Erodes easily, wetness.	Erodes easily.
515---------- Borosaprists	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, soil blowing.	Wetness.
516B, 516D-------- Fragiorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
517B---------- Lode	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily, droughty.
517D, 517F-------- Lode	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
518---------- Humaquepts	Slight---------	Severe: ponding.	Slight---------	Ponding, frost action.	Ponding--------	Wetness.
519A---------- Monico	Moderate: seepage.	Severe: seepage, piping.	Severe: no water.	Frost action---	Soil blowing, wetness.	Droughty, wetness.
520B---------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
521B---------- Pence	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
522D: Entic Fragiorthods----	Severe: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
Typic Dystrochrepts---	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
523B: Entic Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Typic Haplaquepts	Slight---------	Severe: ponding.	Slight---------	Ponding--------	Ponding--------	Wetness.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
524D, 524F-------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
525B-------------- Entic Haplorthods	Severe: seepage.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
525D, 525F-------- Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
527: Borohemists------	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Borosaprists-----	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
528, 529---------- Borohemists	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
530: Borosaprists-----	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Histic Humaquepts	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
531C-------------- Champion	Moderate: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
532F: Champion---------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, droughty.
Haplorthods------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
533B-------------- Entic Fragiorthods	Severe: seepage.	Severe: seepage.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
534B-------------- Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
534D-------------- Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
535B-------------- Vilas	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
535D---------- Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
536F---------- Entic Haplorthods	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
537B---------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
538B, 538D--------- Entic Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
539B---------- Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
540B:						
Entic Fragiorthods----	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Typic Fragiaquods	Slight---------	Severe: wetness.	Severe: no water.	Frost action---	Wetness, rooting depth.	Wetness, rooting depth.
Borosaprists-----	Slight---------	Severe: excess humus, ponding.	Slight---------	Ponding, frost action.	Ponding, soil blowing.	Wetness.
541---------- Fluvaquents	Slight---------	Severe: wetness.	Slight---------	Flooding, frost action.	Wetness--------	Wetness.
542B---------- Gogebic	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Large stones, wetness, rooting depth.	Large stones, wetness, droughty.
542D---------- Gogebic	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, large stones, wetness.	Large stones, wetness, slope.
542F---------- Gogebic	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, rooting depth.	Large stones, slope, droughty.
543A---------- Haplaquods	Slight---------	Severe: wetness.	Slight---------	Favorable------	Wetness--------	Wetness.
544C, 544D, 544F-- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
545B, 545D, 545F, 546C, 546D, 546F, 547B---------- Haplorthods	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
548:						
Humaquepts-------	Slight---------	Severe: wetness.	Slight---------	Flooding, frost action.	Wetness--------	Wetness.
Terric Borosaprists----	Slight---------	Severe: excess humus, wetness.	Slight---------	Flooding, frost action.	Wetness, soil blowing.	Wetness.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
549B:						
Karlin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Pence	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
549D, 549F:						
Karlin	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Pence	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
550--- Terric Borosaprists	Slight---	Severe: excess humus, wetness.	Slight---	Flooding, frost action.	Wetness, soil blowing.	Wetness.
551A--- Typic Fragiorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
552F, 553D--- Kalkaska	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
554B--- Alfic Fragiorthods	Severe: seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Large stones---	Large stones, wetness.
555B--- Entic Haplorthods	Variable---	Variable---	Variable---	Variable---	Variable---	Variable.
556--- Haplaquods	Slight---	Severe: ponding.	Slight---	Ponding---	Ponding---	Wetness.

TABLE 17.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
50:												
Aquents	0-60	Variable	---	---	---	---	---	---	---	---	---	---
Histosols	0-51	Muck	PT	A-8	0	0	---	---	---	---	---	NP
	51-60	Variable	---	---	---	---	---	---	---	---	---	---
51:												
Lupton	0-10	Muck	PT	A-8	0	0	---	---	---	---	---	---
	10-60	Muck	PT	A-8	0	0	---	---	---	---	---	---
Cathro	0-7	Muck	PT	A-8	0	0	---	---	---	---	---	---
	7-26	Muck	PT	A-8	0	0	---	---	---	---	---	---
	26-60	Fine sandy loam, very fine sandy loam, gravelly sandy loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	70-95	35-95	20-75	20-40	4-20
Humaquepts	0-60	Variable	---	---	---	---	---	---	---	---	---	---
52:												
Greenwood	0-18	Peat	PT	A-8	0	0	---	---	---	---	---	---
	18-60	Mucky peat	PT	A-8	0	0	---	---	---	---	---	---
Merwin	0-8	Peat	PT	A-8	0	0	---	---	---	---	---	---
	8-36	Mucky peat	PT	A-8	0	0	---	---	---	---	---	---
	36-60	Silt loam, gravelly loam, sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0-5	85-100	80-100	35-95	20-75	<30	1-15
53:												
Waucedah	0-10	Muck	PT	A-8	0	0	---	---	---	---	---	---
	10-60	Loam, fine sandy loam, sandy loam.	SM, ML, SC, CL	A-2-4, A-4	0	0	100	100	70-95	30-75	<25	3-8
Cathro	0-7	Muck	PT	A-8	0	0	---	---	---	---	---	---
	7-26	Muck	PT	A-8	0	0	---	---	---	---	---	---
	26-60	Fine sandy loam, very fine sandy loam, gravelly sandy loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	70-90	35-95	20-75	20-40	4-20
54. Pits												

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
55A, 55B, 55D---- Oconto	0-7	Very fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-4	0	0	80-100	75-100	45-85	25-55	<23	2-7
	7-35	Very fine sandy loam, gravelly sandy loam, loam.	ML, CL, SM, SC	A-2, A-4	0	0	80-100	60-100	35-95	20-75	<28	3-9
	35-60	Sand, very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	---	0-3	30-100	25-95	7-65	1-25	---	NP
56. Pits and dumps												
57A, 57B--------- Padus	0-7	Fine sandy loam	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	7-39	Fine sandy loam, gravelly fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	39-60	Gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
57D, 57F--------- Padus	0-7	Fine sandy loam	SM	A-2, A-4, A-1-b	1-2	0-9	80-100	75-100	45-85	20-50	<21	NP-4
	7-39	Fine sandy loam, gravelly fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-75	<28	NP-10
	39-60	Gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-100	10-70	1-12	---	NP
58B, 58D--------- Trenary	0-4	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	1-2	0-5	95-100	90-100	65-95	35-65	<25	NP-7
	4-12	Fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0-5	95-100	90-100	65-95	35-65	<25	NP-7
	12-23	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2, A-4, A-1	0	0-5	95-100	90-100	45-70	10-40	<25	NP-7
	23-36	Loamy sand, loam	SC, CL, SP-SM	A-2, A-4, A-1	0	0-5	95-100	75-100	45-75	10-65	<30	NP-15
	36-60	Sandy loam-------	SM, ML, CL, SC	A-2, A-4	0	0-5	95-100	90-100	55-90	25-75	<30	NP-10

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
59A---------- Solona	0-6	Stony very fine sandy loam.	ML, CL, SC, SM	A-4	1-2	5-15	80-100	75-100	65-95	35-65	<30	NP-10
	6-36	Very fine sandy loam, sandy loam, loam.	CL, SC-SM, SC, CL-ML	A-2, A-4	0	0-13	80-100	75-100	45-100	25-80	20-30	5-10
	36-60	Fine sandy loam, sandy loam, gravelly sandy loam.	ML, CL, SM, SC	A-2, A-4, A-1	0	0-13	75-100	60-100	35-95	20-75	<30	NP-10
60D:												
Trenary----------	0-4	Fine sandy loam	SM, SC-SM	A-2, A-4	2-3	0-8	95-100	85-100	55-85	30-50	<25	NP-7
	4-12	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0-8	95-100	85-100	65-95	35-65	<25	NP-7
	12-23	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2, A-4, A-1	0	0-8	95-100	85-100	45-70	10-40	<25	NP-7
	23-36	Loam, loamy sand	SC, CL, SP-SM	A-2, A-4, A-1	0	0-8	95-100	75-100	45-75	10-65	<30	NP-15
	36-60	Sandy loam-------	SM, ML, CL, SC	A-2, A-4	0	0-8	95-100	85-100	55-90	25-75	<30	NP-10
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
64A---------- Channing	0-7	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0-5	0-20	95-100	95-100	55-95	25-65	<25	NP-6
	7-24	Very fine sandy loam, fine sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0	0-5	95-100	95-100	55-95	25-75	<25	NP-7
	24-60	Stratified sand to very gravelly sand.	SP, SP-SM	A-1	0	0-10	65-95	40-80	20-30	0-10	---	NP
65----------	0-5	Muck----------	PT	A-8	2-3	8-25	---	---	---	---	---	---
Witbeck	5-18	Silt loam, very fine sandy loam, gravelly fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0-3	8-25	90-100	55-100	35-90	25-70	<35	NP-15
	18-51	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, CL, SC	A-2-4, A-4, A-1-b	0	0-25	75-95	50-90	45-90	20-70	<30	NP-10
	51-60	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, CL, SC	A-2-4, A-4, A-1-b	0	0-25	75-95	50-90	45-90	15-70	<30	NP-10

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
67B---------- Net	0-3	Very fine sandy loam.	SM, SC-SM	A-4, A-2-4	1-5	5-25	95-100	85-95	50-85	30-50	<20	NP-6
	3-28	Silt loam, fine sandy loam, very fine sandy loam.	ML, SM, CL-ML, SC-SM	A-4, A-1-b, A-2-4	0	0-25	95-100	90-100	85-95	40-85	<20	NP-6
	28-49	Gravelly sandy loam, gravelly loamy sand, very fine sandy loam.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-4
	49-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-6
68B:												
Net----------	0-3	Silt loam--------	ML, CL-ML	A-4	1-5	5-25	95-100	85-95	70-95	50-90	<20	NP-6
	3-28	Silt loam, fine sandy loam, very fine sandy loam.	ML, SM, CL-ML, SC-SM	A-4, A-1-b, A-2-4	0	0-25	95-100	90-100	85-95	40-85	<20	NP-6
	28-49	Gravelly sandy loam, gravelly loamy sand, very fine sandy loam.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-4
	49-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-6
Witbeck---------	0-5	Muck----------	PT	A-8	2-3	8-25	---	---	---	---	---	---
	5-18	Silt loam, very fine sandy loam, gravelly fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0-3	8-25	90-100	55-100	35-90	25-70	<35	NP-15
	18-51	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, CL, SC	A-2-4, A-4, A-1-b	0	0-25	75-95	50-90	45-90	20-70	<30	NP-10
	51-60	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, CL, SC	A-2-4, A-4, A-1-b	0	0-25	75-95	50-90	45-90	15-70	<30	NP-10

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
69A:												
Karlin----------	0-2	Fine sandy loam	SM, ML	A-4, A-1, A-2	0	0	90-100	75-100	45-85	20-55	<20	NP-4
	2-35	Fine sandy loam, loamy sand, sandy loam.	SP-SM, SM, ML	A-2, A-4	0	0	90-100	75-100	60-100	10-55	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	35-70	0-15	---	NP
Croswell--------	0-1	Sand----------	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	5-15	---	NP
	1-20	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	---	NP
	20-60	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	3-15	---	NP
70B:												
Sundog----------	0-4	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	1-2	0-20	95-100	75-100	65-95	35-65	<25	NP-6
	4-15	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4, A-2-4	0	0-7	95-100	75-100	50-100	30-90	<25	NP-6
	15-22	Gravelly very fine sandy loam, gravelly fine sandy loam.	SM, SC-SM, GM, GM-GC	A-2-4, A-4	0	0-7	50-95	50-75	45-75	25-50	<25	NP-6
	22-60	Stratified sand to very gravelly coarse sand.	SW, SP-SM, GP, SP	A-1, A-2-4, A-3	0	0-7	50-95	25-90	10-70	0-10	---	NP
Channing--------	0-7	Very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2-4, A-4	1-2	0-25	95-100	85-100	50-85	25-65	<25	NP-6
	7-24	Very fine sandy loam, fine sandy loam, sandy loam.	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0-10	0-25	95-100	95-100	80-95	30-60	<25	NP-7
	24-60	Stratified sand to very gravelly sand.	SP, SP-SM	A-1	0-5	0-25	65-85	35-75	20-30	0-10	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
71D:												
Karlin----------	0-3	Fine sandy loam	SM, SC-SM	A-2, A-4	1-2	0	90-100	75-100	50-85	30-50	<25	NP-7
	3-35	Loamy fine sand, loamy sand, sandy loam.	SP-SM, SM	A-2, A-4	0	0	90-100	75-100	60-100	10-50	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	90-100	75-100	35-70	0-15	---	NP
Vilas----------	0-4	Stony loamy sand	SM, SP-SM	A-1, A-2	1-2	5-10	80-100	75-100	35-90	12-30	---	NP
	4-17	Loamy sand-------	SP-SM, SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	17-24	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	5-20	---	NP
	24-60	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	1-20	---	NP
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
72B, 72D, 72F---- Karlin	0-3	Fine sandy loam	SM, ML	A-4, A-1, A-2	0	0	90-100	75-100	45-85	20-55	<20	NP-4
	3-35	Loamy fine sand, loamy sand, sandy loam.	SP-SM, SM, ML	A-2, A-4	0	0	90-100	75-100	60-100	10-55	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	35-70	0-15	---	NP
73A---------- Gaastra	0-4	Silt loam--------	CL-ML, CL	A-4	1-2	0	95-100	90-100	85-100	50-90	20-30	5-10
	4-22	Silt loam, very fine sandy loam.	ML, CL, SM, SC	A-4	0	0	95-100	90-100	60-100	35-60	<30	NP-10
	22-51	Silt loam, very fine sandy loam.	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	95-100	90-100	85-100	40-90	20-35	5-15
	51-60	Silt loam, fine sandy loam, very fine sandy loam.	CL-ML, CL, SC, SC-SM	A-4	0	0	95-100	90-100	85-100	40-90	20-30	5-10
74A---------- Au Gres	0-3	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	95-100	85-100	40-65	5-15	---	NP
	3-32	Sand----------	SP-SM, SM, SC-SM	A-2-4, A-3, A-1-b	0	0	95-100	85-100	40-75	5-30	<25	NP-7
	32-60	Sand----------	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	95-100	85-100	40-60	5-15	---	NP
75---------- Kinross	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	5-52	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP
	52-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
76---------- Ensley	0-9	Fine sandy loam	SC-SM	A-2-4, A-4, A-1-b	1-2	0-10	85-100	75-100	45-85	20-40	20-25	4-7
	9-20	Sandy loam, fine sandy loam.	CL, SC, SC-SM, CL-ML	A-2-4, A-4, A-6, A-1	0	0-10	85-100	75-100	65-90	30-65	15-30	4-16
	20-60	Sandy loam, fine sandy loam.	SC-SM, SM, SC	A-2-4, A-4, A-1	0	0-10	95-100	90-100	55-90	25-55	<25	2-9
77B, 77D---------- Vilas	0-4	Loamy sand-------	SM, SP-SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	4-17	Loamy sand-------	SP-SM, SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	17-24	Sand-------------	SM, SP-SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	5-20	---	NP
	24-60	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	1-20	---	NP
78B, 78D, 78F: Vilas----------	0-4	Loamy sand-------	SM, SP-SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	4-17	Loamy sand-------	SP-SM, SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	17-24	Sand-------------	SM, SP-SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	5-20	---	NP
	24-60	Sand-------------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	1-20	---	NP
Karlin----------	0-3	Fine sandy loam	SM, ML	A-4, A-1, A-2	0	0	90-100	75-100	45-85	20-55	<20	NP-4
	3-35	Loamy fine sand, loamy sand, sandy loam.	SP-SM, SM, ML	A-2, A-4	0	0	90-100	75-100	60-100	10-55	<20	NP-4
	35-60	Sand-------------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	35-70	0-15	---	NP
79A, 79B, 79D---- Fence	0-2	Silt loam--------	ML, CL-ML, CL	A-4	0	0	100	100	90-100	70-100	20-35	NP-10
	2-9	Silt loam, very fine sandy loam.	ML, CL, SM, SC	A-4	0	0	100	100	85-100	40-100	<30	NP-9
	9-41	Silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	0	100	100	85-100	70-100	<30	NP-12
	41-60	Stratified silt loam to very fine sand.	ML, CL-ML	A-4	0	0	100	100	85-100	50-100	<25	NP-7

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
80B, 80D, 80F---- Pence	0-4	Fine sandy loam	SM, ML	A-4, A-2, A-1	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-20	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	20-33	Gravelly sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-2, A-1, A-3	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	33-60	Gravelly coarse sand, sand, sand and gravel.	SP, SM	A-1, A-3, A-2	0-4	0-15	55-85	50-75	15-55	2-15	---	NP
82B, 82D, 82F---- Keweenaw	0-1	Loamy fine sand	SM, SC, SC-SM, SP-SM	A-2, A-1-b, A-4	0	0-10	90-100	75-100	35-85	10-40	<20	NP-10
	1-23	Loamy fine sand, loamy sand.	SM, SC, SC-SM, SP-SM	A-2, A-1-b, A-4, A-3	0	0-25	95-100	90-100	50-85	15-35	<20	NP-10
	23-33	Sand, loamy fine sand, loamy sand.	SM, SC, SP-SM, SC-SM	A-2, A-3, A-1-b, A-4	0	0-25	95-100	90-100	50-85	15-35	<20	NP-10
	33-39	Fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC, SP-SM, SC-SM	A-2, A-3, A-1-b, A-4	0	0-25	85-100	60-100	30-85	5-50	<30	NP-10
	39-60	Loamy sand, gravelly loamy sand, sandy loam.	SM, SC, SC-SM, SP-SM	A-2, A-3 A-1-b, A-4	0	0-25	85-100	60-100	30-85	10-30	<20	NP-10
100B, 100D: Keweenaw--------	0-1	Loamy fine sand	SM, SC, SC-SM, SP-SM	A-2, A-1-b, A-4	0	0-10	90-100	75-100	35-85	10-40	<20	NP-10
	1-23	Loamy fine sand, loamy sand.	SM, SC, SC-SM, SP-SM	A-2, A-1-b, A-4, A-3	0	0-25	95-100	90-100	50-85	15-35	<20	NP-10
	23-33	Sand, loamy fine sand, loamy sand.	SM, SC, SP-SM, SC-SM	A-2, A-3, A-1-b, A-4	0	0-25	95-100	90-100	50-85	15-35	<20	NP-10
	33-39	Fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC, SP-SM, SC-SM	A-2, A-3, A-1-b, A-4	0	0-25	85-100	60-100	30-85	5-50	<30	NP-10
	39-60	Loamy sand, gravelly loamy sand, sandy loam.	SM, SC, SC-SM, SP-SM	A-2, A-3, A-1-b, A-4	0	0-25	85-100	60-100	30-85	10-30	<20	NP-10

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
100B, 100D:												
Karlin----------	0-3	Fine sandy loam	SM, ML	A-4, A-1, A-2	0	0	90-100	75-100	45-85	20-55	<20	NP-4
	3-35	Loamy fine sand, loamy sand, sandy loam.	SP-SM, SM, ML	A-2, A-4	0	0	90-100	75-100	60-100	10-55	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	35-70	0-15	---	NP
101B:												
Trenary----------	0-4	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	1-2	0-5	95-100	90-100	65-95	35-65	<25	NP-7
	4-12	Fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0-5	95-100	90-100	65-95	35-65	<25	NP-7
	12-23	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2, A-4, A-1	0	0-5	95-100	90-100	45-70	10-40	<25	NP-7
	23-36	Loamy sand, loam	SC, CL, SP-SM	A-2, A-4, A-1	0	0-5	95-100	90-100	45-90	10-40	<30	NP-15
	36-60	Sandy loam-------	SM, ML, CL, SC	A-2, A-4	0	0-5	95-100	90-100	55-90	25-75	<30	NP-10
Solona----------	0-6	Stony very fine sandy loam.	ML, CL, SC, SM	A-4	1-2	5-15	80-100	75-100	65-95	35-65	<30	NP-10
	6-36	Fine sandy loam, very fine sandy loam, loam.	CL, SC-SM, SC, CL-ML	A-2, A-4	0-5	0-13	80-100	75-100	45-100	25-80	20-30	5-10
	36-60	Fine sandy loam, sandy loam, gravelly sandy loam.	ML, CL, SM, SC	A-2, A-4, A-1	0-5	0-13	75-100	60-100	35-95	20-75	<30	NP-10
102B---------- Escanaba	0-1	Loamy fine sand	SM, SC-SM, SW-SM, SP-SM	A-2-4, A-3, A-1-b	0	0-20	95-100	85-100	40-75	5-30	<25	NP-7
	1-24	Loamy fine sand, fine sand, sand.	SM, SC-SM, SW-SM, SP-SM	A-2-4, A-3, A-1-b	0	0-20	90-100	85-100	40-75	5-30	<25	NP-7
	24-36	Loamy fine sand, loamy sand, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0-20	90-100	85-100	50-85	15-55	<25	NP-7
	36-49	Fine sandy loam, sandy loam.	SC, SC-SM, CL, CL-ML	A-2-4, A-4	0	0-20	90-100	85-100	50-85	25-55	<30	4-10
	49-60	Fine sandy loam, sandy loam.	SM, SC, ML, CL	A-2-4, A-4	0	0-20	90-100	85-100	50-85	25-55	<30	NP-10

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
103B, 103D:												
Wabeno----------	0-2	Silt loam--------	ML, CL-ML	A-4	1-2	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam--------	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam--------	ML, CL, CL-ML	A-4	0-5		90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, gravelly sandy loam, loam.	SM, SC, SC-SM	A-1, A-2-4	0-5	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-15	70-90	65-90	25-60	10-25	<23	NP-6
Sarona----------	0-2	Stony fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-4	1-2	0-15	75-100	75-100	45-85	25-55	<20	2-7
	2-33	Fine sandy loam, sandy loam, loamy fine sand.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0-2	0-15	75-100	75-100	40-95	13-55	<20	NP-7
	33-37	Sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4	0	0-15	65-100	65-100	40-90	12-40	<20	NP-7
	37-60	Loamy sand, sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4	0	0-15	65-95	65-95	40-80	12-40	<20	NP-7
104A, 104B, 104D-Stambaugh	0-4	Silt loam--------	ML, CL-ML	A-4	1-2	0-8	100	90-100	80-100	55-90	<25	2-7
	4-18	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-8	100	90-100	80-100	55-90	<25	2-7
	18-39	Silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	0-8	100	90-100	80-100	80-95	<30	2-9
	39-60	Gravelly sand, very gravelly sand.	SP, SP-SM	A-1	0	0-15	70-90	25-60	15-40	0-10	---	NP
105D:												
Wabeno----------	0-2	Silt loam--------	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam--------	ML, CL-ML,	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam--------	ML, CL, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, loam, gravelly sandy loam.	SM, SC, SC-SM	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-15	70-90	65-90	25-60	10-25	<23	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
105D:												
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
106D---------- Champion	0-4	Very fine sandy loam.	ML, CL-ML	A-4	2-3	5-20	95-100	85-100	70-95	50-70	<25	NP-7
	4-20	Cobbly silt loam, silt loam, very fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	NP-7
	20-49	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6
	49-60	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	80-100	50-90	25-80	5-50	<25	NP-6
107B, 107D, 107F- Sarona	0-2	Stony fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-4	1-2	0-15	80-100	75-98	55-90	30-55	<25	NP-7
	2-33	Fine sandy loam, sandy loam, loamy fine sand.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0-2	0-15	80-100	75-98	30-90	10-55	<23	NP-6
	33-37	Loam, sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4	0	0-15	55-100	50-98	30-90	13-55	<23	NP-6
	37-60	Loamy sand, sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4, A-3	0	0-15	55-100	50-98	20-75	7-45	<25	NP-7
108D, 108F:												
Sarona----------	0-2	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1	2-3	0-15	80-100	75-98	30-90	10-55	<23	NP-6
	2-33	Fine sandy loam, sandy loam, loamy fine sand.	SM, SP-SM, ML, CL-ML	A-2, A-4, A-1	0-2	0-15	80-100	75-98	30-90	10-55	<23	NP-6
	33-37	Loam, sandy loam, gravelly sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-1, A-4	0	0-15	55-100	50-98	30-90	13-55	<23	NP-6
	37-60	Loamy sand, sandy loam, gravelly sandy loam.	SM, SC-SM, SP-SM	A-2, A-1, A-4, A-3	0	0-15	55-100	50-98	20-75	7-75	<25	NP-7
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
109D---------- Udorthents	0-10	Gravelly sandy loam.	---	---	---	---	---	---	---	---	---	NP-15
	10-60	Variable---------	---	---	---	---	---	---	---	---	---	---
110B, 110D:												
Petticoat-------	0-1	Silt loamy-------	ML, CL-ML	A-4	2-3	5-20	95-100	85-100	75-95	55-85	<25	NP-7
	1-38	Silt loam, fine sandy loam.	ML, SM	A-4	0	8-20	95-100	85-100	65-95	35-75	<30	NP-7
	38-60	Gravelly loamy sand, gravelly loamy fine sand.	SM, SP-SM, GM, GP-GM	A-2-4, A-4, A-1, A-3	0	8-20	60-90	50-70	25-75	5-50	<20	NP-4
Wabeno----------	0-2	Silt loam--------	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam--------	ML, CL-ML,	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam--------	ML, CL, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, gravelly sandy loam, loam.	SM, SC, SC-SM,	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-15	70-90	65-90	25-60	10-25	<23	NP-6
111B:												
Champion--------	0-4	Very fine sandy loam.	ML, CL-ML	A-4	2-35	5-20	95-100	85-100	70-90	50-70	<25	NP-7
	4-20	Cobbly silt loam, silt loam, very fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	NP-7
	20-49	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6
	49-60	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
111B:												
Net----------	0-3	Very fine sandy loam.	SM, SC-SM	A-4, A-2-4	1-55	5-25	95-100	85-95	50-85	30-50	<20	NP-6
	3-28	Silt loam, fine sandy loam, very fine sandy loam.	ML, SM, CL-ML, SC-SM	A-4, A-1-b, A-2-4	0	0-25	95-100	90-100	85-95	40-85	<20	NP-6
	28-49	Gravelly sandy loam, gravelly loamy sand, very fine sandy loam.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-85	25-70	15-45	<20	NP-4
	49-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-6
112B, 112D------- Sundog	0-4	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-20	95-100	75-100	65-95	35-65	<25	NP-6
	4-15	Silt loam, gravelly fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4, A-2-4	0	0-7	50-95	50-75	45-75	25-90	<25	NP-6
	15-22	Gravelly very fine sandy loam, gravelly fine sandy loam.	SM, SC-SM, GM, GM-GC	A-2-4, A-4	0	0-7	50-95	50-75	45-75	25-50	<25	NP-6
	22-60	Stratified sand to very gravelly coarse sand.	SW, SP-SM, GP, SP	A-1, A-2-4, A-3	0	0-7	50-95	25-90	10-70	0-10	---	NP
112F---------- Sundog	0-4	Cobbly fine sandy loam.	ML, CL-ML, SM, SC-SM	A-2-4, A-4	0	20-50	85-100	80-100	45-95	25-90	<25	NP-7
	4-15	Silt loam, gravelly fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-7	50-95	50-75	45-75	25-90	<25	NP-7
	15-22	Gravelly very fine sandy loam, gravelly fine sandy loam.	SM, SC-SM, GM, GM-GC	A-2-4, A-4	0	0-7	50-95	50-75	45-70	30-50	<25	NP-7
	22-60	Stratified sand to very gravelly coarse sand.	SW, SP-SM, GP, SP	A-1, A-2-4, A-3	0	0-7	50-95	25-75	10-55	0-10	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
113A---------- Sundog	0-2	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-20	95-100	90-100	75-95	45-65	<25	NP-6
	2-25	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-7	95-100	90-100	50-100	35-90	<25	NP-6
	25-60	Stratified sand to very gravelly coarse sand.	SW, SP-SM, GP, SP	A-1, A-2-4, A-3	0	0-7	50-95	25-80	10-70	0-10	---	NP
114A:												
Minocqua--------	0-4	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	4-25	Silt loam, loam, gravelly loam.	SC, SM, CL, ML	A-2, A-4, A-6	0-1	0-9	80-100	75-100	45-100	25-90	<35	NP-13
	25-29	Gravelly loamy sand, loamy coarse sand.	SM, GM, GP, SP	A-2, A-1, A-3	0	0-9	40-100	35-100	5-70	2-40	<20	NP-4
	29-60	Gravelly coarse sand, sand, gravelly sand.	SP, SM, GP, GM	A-1, A-3, A-2	0	0-9	35-100	30-100	5-70	0-30	---	NP
Channing--------	0-7	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0	0-20	95-100	95-100	55-95	25-65	<25	NP-6
	7-24	Very fine sandy loam, fine sandy loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0	0-5	95-100	95-100	55-95	25-75	<25	NP-7
	24-60	Stratified sand to very gravelly sand.	SP, SP-SM	A-1	0	0-10	65-90	40-80	20-30	0-10	---	NP
115A---------- Manitowish	0-1	Fine sandy loam	SM, ML	A-4	0	0-7	80-100	75-100	50-85	35-55	<21	NP-4
	1-19	Sandy loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2	0	0-7	80-100	85-100	45-95	30-75	<25	NP-7
	19-26	Loamy sand, gravelly loamy sand.	SM, SC-SM, GM, GM-GC	A-2, A-1, A-3, A-4	0	0-8	55-100	50-100	20-90	5-50	<25	NP-6
	26-60	Gravelly sand, gravelly coarse sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0-15	55-100	50-75	20-70	0-12	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
116B, 116D-------	0-2	Silt loam---------	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<25	NP-6
Wabeno	2-23	Silt loam---------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam---------	ML, CL, CL-ML	A-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	32-50	Very fine sandy loam, loam, gravelly sandy loam.	SM, SC, SC-SM	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-15	70-90	65-90	25-60	10-25	<23	NP-6
121B, 121D-------	0-6	Silt loam---------	CL-ML, ML	A-4	1-2	2-8	90-100	85-95	75-95	55-90	<20	NP-4
Peavy	6-27	Silt loam, very fine sandy loam, fine sandy loam.	CL-ML, ML, SM, SC-SM	A-4	0	2-8	90-100	85-95	60-95	35-85	<20	NP-4
	27-41	Channery loam, very channery loam, channery sandy loam.	GC, SC, CL-ML, CL	A-4, A-2-4, A-1-b	0	2-8	45-85	35-75	25-70	20-55	20-30	4-11
	41-60	Channery loam, very channery loam, channery sandy loam.	GM, SM, ML, SC-SM	A-4, A-2-4, A-1-b	0	7-15	45-85	35-75	25-70	20-55	<25	NP-7
122B, 122D:												
Sarona----------	0-2	Fine sandy loam	SM, SC-SM	A-2, A-4, A-1	2-3	0-25	55-100	50-98	30-90	15-50	<25	NP-7
	2-33	Fine sandy loam, sandy loam, loamy fine sand.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0-2	0-15	80-100	75-98	30-90	15-55	<25	NP-7
	33-37	Loam, sandy loam, gravelly sandy loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0	0-15	55-100	50-98	30-95	15-80	<25	NP-7
	37-60	Sandy loam, gravelly sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2, A-1, A-4	0	0-15	55-100	50-98	20-80	7-50	15-25	NP-7
Karlin----------	0-2	Fine sandy loam	SM, SC-SM	A-2, A-4	1-2	0	90-100	75-100	50-85	30-50	<25	NP-7
	2-35	Loamy fine sand, loamy sand, sandy loam.	SP-SM, SM	A-2, A-4	0	0	90-100	75-100	60-100	10-50	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	90-100	75-100	35-70	0-15	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
123B, 123D-------	0-3	Loamy fine sand	SM, SC-SM	A-2, A-4	0	0	100	100	50-80	15-50	<25	NP-7
Ocqueoc	3-23	Fine sand, loamy fine sand.	SP-SM, SM, SC-SM	A-2, A-3, A-4	0	0	100	100	50-80	5-50	<25	NP-7
	23-60	Stratified fine sand to silt loam.	SC-SM, CL-ML, CL, SC	A-2, A-4, A-6	0	0	100	100	65-95	20-85	20-40	4-20
124B, 125B:												
Wabeno----------	0-2	Silt loam--------	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam--------	ML, CL, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, gravelly sandy loam, loam.	SM, SC, SC-SM	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-15	70-90	65-90	25-60	10-25	<23	NP-6
Net----------	0-3	Silt loam--------	ML, CL-ML	A-4	1-5	5-25	95-100	85-95	70-95	50-90	<20	NP-6
	3-28	Silt loam, fine sandy loam, very fine sandy loam.	ML, SM, CL-ML, SC-SM	A-4, A-1-b, A-2-4	0	0-25	75-100	50-95	40-95	20-85	<20	NP-6
	28-49	Gravelly sandy loam, gravelly loamy sand, very fine sandy loam.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	95-100	50-85	25-70	15-45	<20	NP-4
	49-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-25	75-100	50-75	25-70	15-45	<20	NP-6
126B, 126D, 126F-	0-4	Very fine sandy loam.	ML, CL-ML	A-4	2-3	10-20	95-100	85-100	70-95	50-70	<25	NP-7
Champion	4-20	Cobbly silt loam, silt loam, very fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	NP-7
	20-49	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6
	49-60	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	80-100	50-90	25-80	5-50	<25	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
127D---------- Goodman	0-3	Very stony silt loam.	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam--------	ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	5-14	Silt loam--------	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	14-33	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	33-49	Fine sandy loam, loamy sand, sandy loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-90	15-75	<23	NP-6
	49-60	Loamy sand, fine sandy loam, sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-85	15-75	<23	NP-6
128B:												
Goodman---------	0-3	Silt loam--------	ML, CL-ML	A-4	1-2	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam--------	ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	5-14	Silt loam--------	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	14-33	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	33-49	Fine sandy loam, loamy sand, sandy loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-90	15-75	<23	NP-6
	49-60	Sandy loam, fine sandy loam, loamy sand.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-85	15-75	<23	NP-6
Wabeno----------	0-2	Silt loam--------	ML, CL-ML	A-4	1-2	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam--------	ML, CL, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, gravelly sandy loam, loam.	SM, SC, SC-SM	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-15	70-90	65-90	25-60	10-25	<23	NP-6
Sundog----------	0-3	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	1-2	0-10	95-100	90-100	75-95	45-65	<25	NP-6
	3-46	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-7	95-100	90-100	70-100	45-90	<25	NP-6
	46-60	Sand----------	SP-SM, SM	A-1, A-2-4, A-3	0	0-5	95-100	90-100	45-70	5-15	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
128D:												
Goodman	0-3	Silt loam	ML, CL-ML	A-4	1-2	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam	ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	5-14	Silt loam	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	14-33	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	33-49	Fine sandy loam, loamy sand, sandy loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-90	15-75	<23	NP-6
	49-60	Sandy loam, fine sandy loam, gravelly loamy sand.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-85	15-75	<23	NP-6
Wabeno	0-2	Silt loam	ML, CL-ML	A-4	1-2	0-15	90-100	85-100	70-100	60-90	<25	NP-6
	2-23	Silt loam	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	23-32	Silt loam	ML, CL, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-90	<30	NP-10
	32-50	Very fine sandy loam, gravelly sandy loam, loam.	SM, SC, SC-SM	A-1, A-2-4	0	0-15	85-100	70-95	35-90	15-75	<30	NP-10
	50-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-15	70-90	65-90	25-60	10-25	<23	NP-6
Sundog	0-3	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	1-2	0-20	95-100	75-100	65-95	35-65	<25	NP-6
	3-46	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-7	95-100	90-100	70-100	45-90	<25	NP-6
	46-60	Sand	SP-SM, SM	A-1, A-2-4, A-3	0	0-5	95-100	90-100	45-70	5-15	<25	NP
128F:												
Goodman	0-3	Silt loam	ML, CL-ML	A-4	1-2	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam	ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	5-14	Silt loam	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	14-33	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	33-49	Fine sandy loam, gravelly loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	49-60	Sandy loam, fine sandy loam, loamy sand.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	0	0-10	65-100	75-100	40-85	15-75	<23	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
128F:												
Sundog----------	0-3	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	1-2	0-20	95-100	75-100	65-95	35-65	<25	NP-6
	3-46	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-7	95-100	90-100	70-100	45-90	<25	NP-6
	46-60	Sand----------	SP-SM, SM	A-1, A-2-4, A-3	0	0-5	95-100	90-100	45-70	5-15	<25	NP
163B, 163D, 163F-Sagola	0-3	Fine sandy loam	SM, SC-SM	A-4, A-2-4	1-2	0-20	95-100	75-100	50-85	30-50	<25	NP-7
	3-18	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-4	0-2	0-20	95-100	75-100	50-95	40-50	<25	NP-7
	18-47	Loamy sand, sandy loam, fine sandy loam.	SP-SM, SM, SC-SM	A-2-4, A-4, A-1-b	0-2	0-20	95-100	75-100	35-85	10-50	<25	NP-7
	47-60	Sandy loam, loamy fine sand.	SP-SM, SM, SC-SM	A-2-4, A-4, A-1-b	0-2	0-20	95-100	75-100	35-75	10-40	<25	NP-7
164B---------- Alstad	0-4	Loam----------	CL, CL-ML, ML	A-4	0	0-3	80-100	75-98	65-98	45-98	<28	3-9
	4-21	Sandy loam, loam, fine sandy loam.	ML, CL, SM, SC	A-2, A-4	0	0-3	80-100	75-98	50-98	30-98	<26	2-8
	21-26	Fine sandy loam, clay loam, loam.	CL, SC, SM, ML	A-4, A-6, A-2	0	0-3	80-100	75-98	50-95	25-75	20-40	5-20
	26-42	Clay loam, loam	CL, SC	A-6, A-4, A-2, A-7	0	0-3	80-100	75-98	45-95	20-75	25-45	9-25
	42-60	Sandy loam, loam, clay loam.	SC, CL, SM, ML	A-6, A-4, A-2, A-1	0	0-3	80-100	75-98	45-95	20-75	20-45	3-25
165B:												
Sundog----------	0-4	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-20	95-100	75-100	65-95	35-65	<25	NP-6
	4-15	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4, A-2-4	0	0-7	95-100	75-100	50-100	30-90	<25	NP-6
	15-22	Gravelly very fine sandy loam, gravelly fine sandy loam.	SM, SC-SM, GM, GM-GC	A-2-4, A-4	0	0-7	50-95	50-75	45-75	25-50	<25	NP-6
	22-60	Stratified sand to very gravelly coarse sand.	SW, SP-SM, GP, SP	A-1, A-2-4, A-3	0	0-7	50-95	25-90	10-70	0-10	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
165B:												
Channing--------	0-7	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0-5	0-20	95-100	95-100	55-95	25-65	<25	NP-6
	7-24	Very fine sandy loam, fine sandy loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0	0-5	95-100	95-100	55-95	25-75	<25	NP-7
	24-60	Stratified sand to very gravelly sand.	SP, SP-SM	A-1	0	0-10	65-95	40-80	20-30	0-10	---	NP
166F----------	0-1	Silt loam--------	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
Soperton	1-25	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	25-41	Gravelly sandy loam, loam.	SM, SC, SC-SM	A-4, A-2, A-1-b	0	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	41-60	Gravelly loamy sand, sandy loam.	SM, SP-SM	A-1, A-2, A-4	0	0-30	70-100	65-90	25-70	10-45	<20	NP-4
167A----------	0-4	Loam----------	ML, CL-ML	A-4	0	0-15	85-100	75-100	65-100	50-90	<25	NP-7
Monico	4-7	Fine sandy loam, loam, silt loam.	SM, SC, ML, CL	A-4, A-2-4	0	0-15	65-100	75-100	50-95	30-85	<30	NP-10
	7-47	Sandy loam, gravelly sandy loam.	SM, GM, GM-GC	A-1, A-2	0	0-15	60-100	60-95	30-85	13-35	<20	NP-4
	47-60	Sandy loam, gravelly sandy loam.	SM, GM, GM-GC	A-1, A-2	0	0-15	60-100	60-95	30-85	13-35	<20	NP-4
168F:												
Soperton--------	0-1	Silt loam--------	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
	1-25	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	25-41	Gravelly sandy loam, loam.	SM, SC, SC-SM	A-4, A-2, A-1-b	0	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	41-60	Gravelly loamy sand, sandy loam.	SM, SP-SM	A-1, A-2, A-4	0	0-30	70-100	65-90	25-70	10-45	<20	NP-4
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
500B, 500D-------	0-3	Silt loam--------	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<25	NP-6
Wabeno	3-19	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-95	<25	NP-7
	19-63	Sandy loam, cobbly, loamy sand, cobbly sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0	0-30	70-100	65-95	30-65	10-35	<30	NP-10
	63-72	Cobbly sandy loam, gravelly loamy sand, loamy sand.	SM, SC-SM, SP-SM	A-1, A-2-4	0	0-30	70-90	65-90	25-60	10-25	<23	NP-6
501F-------------	0-1	Silt loam--------	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
Soperton	1-25	Silt loam--------	ML, CL-ML	A-4	0	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	25-41	Gravelly sandy loam, loam.	SM, SC, SC-SM	A-4, A-2, A-1-b	0	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	41-60	Gravelly loamy sand, sandy loam.	SM, SP-SM	A-1, A-2, A-4	0	0-30	70-100	65-90	25-70	10-45	<20	NP-4
502B, 502D, 502F-	0-4	Very fine sandy loam.	ML, CL-ML	A-4	2-3	5-20	95-100	85-100	70-95	50-70	<25	NP-7
Champion	4-20	Cobbly silt loam, silt loam, very fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	NP-7
	20-49	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6
	49-60	Gravelly fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	80-100	50-90	25-80	5-50	<25	NP-6
503A-------------	0-7	Loam-------------	ML, CL-ML	A-4	0-2	0-15	80-100	75-100	65-90	50-70	<25	NP-7
Typic Fragiaquods	7-15	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0-2	0-15	80-100	75-100	50-90	30-55	<25	NP-7
	15-38	Sandy loam, fine sandy loam, cobbly loamy sand.	SM, SC-SM, SP-SM	A-2, A-4, A-1-b	0-2	0-25	85-95	75-90	40-75	10-50	<20	NP-7
	38-60	Sandy loam, loamy sand, cobbly sandy loam.	SM, SP-SM	A-2-4, A-1-b	0-2	0-25	89-95	75-90	35-60	10-35	<20	NP-4

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
504B, 504D, 504F-Pence	0-2	Fine sandy loam	SM, ML	A-4, A-2, A-1	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	2-20	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	20-35	Gravelly sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-2, A-1, A-3	0	0-15	55-100	50-100	25-75	2-30	---	NP
	35-60	Gravelly coarse sand, sand, sand and gravel.	SP, SM	A-1, A-3, A-2	0	0-15	55-85	50-75	15-55	2-15	---	NP
505, 506---------Humaquepts	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
507A----------Monico	0-4	Loam----------	ML, CL-ML	A-4	0	0-15	85-100	75-100	65-100	50-90	<25	NP-7
	4-7	Fine sandy loam, loam, silt loam.	SM, SC, ML, CL	A-4, A-2-4	0	0-15	65-100	60-95	50-95	30-85	<30	NP-10
	7-47	Sandy loam, gravelly sandy loam.	SM, GM, GM-GC	A-1, A-2	0	0-15	90-100	75-95	40-70	20-40	<20	NP-6
	47-60	Gravelly loamy sand, loamy sand, gravelly sandy loam.	SM, GM, GM-GC	A-1, A-2	0	0-15	60-100	60-95	30-85	13-35	<20	NP-4
508A----------Beechwood	0-4	Silt loam--------	ML, CL-ML	A-4	0	0-7	95-100	85-100	80-100	50-90	<25	NP-7
	4-34	Silt loam, loam, sandy loam.	ML, CL-ML	A-4	0	0-7	95-100	85-100	80-100	50-90	<25	NP-7
	34-49	Silt loam, loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-2-4, A-4	0	0-7	95-100	85-100	50-95	20-90	<25	NP-7
	49-71	Loamy sand, gravelly sandy loam, cobbly sandy loam.	SM	A-2-4, A-4, A-1-b	0-5	8-50	85-95	70-90	35-90	15-50	<20	NP
509A----------Typic Dystrochrepts	0-2	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	0-5	100	90-100	85-100	60-90	15-35	2-12
	2-60	Cobbly silt loam, silt loam, gravelly sandy loam.	CL-ML, SC-SM, SM, ML	A-2-4, A-4, A-1-b	0	5-30	80-95	75-90	45-90	20-75	<25	NP-7
	60-72	Cobbly silt loam, silt loam, gravelly sandy loam.	CL-ML, SC-SM, SM, ML	A-2-4, A-4, A-1-b	0	5-30	80-95	75-90	45-90	20-75	<25	NP-7

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
510----------	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
Borosaprists	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
511B, 511D, 511F-Typic Dystrochrepts	0-3	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-2-4, A-4, A-1-b	0	0-5	90-100	75-100	40-95	20-55	<25	2-7
	3-41	Fine sandy loam, cobbly silt loam, gravelly sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0	5-15	90-100	75-95	75-90	10-75	<25	NP-7
	41-60	Sand, gravelly sand, very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-3, A-1-b, A-2-4	0	5-15	50-85	40-85	30-55	3-12	---	NP
512----------	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
Borosaprists	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
513B----------	0-2	Fine sandy loam	SM, SC-SM	A-4, A-2-4	0	0-15	80-100	80-100	50-70	30-40	<25	NP-7
Entic Haplorthods	2-30	Fine sandy loam, loam, gravelly sandy loam.	SM, SC, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0	0-15	80-100	70-100	40-95	10-50	<25	NP-10
	30-60	Sand, gravelly coarse sand.	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	0-5	90-100	55-100	40-80	0-20	---	NP
514B----------	0-8	Silt loam---------	ML, CL-ML	A-4	1-2	0-8	100	90-100	80-100	55-90	<25	2-7
Stambaugh	8-23	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0-8	100	90-100	80-100	55-90	<25	2-7
	23-44	Silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	0-8	100	90-100	80-100	80-95	<30	2-9
	44-60	Gravelly sand, very gravelly sand.	SP, SP-SM	A-1	0	0-15	70-90	25-60	15-40	0-10	---	NP
515----------	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
Borosaprists	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
516B, 516D------- Fragiorthods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
517B, 517D, 517F-Lode	0-7	Silt loam--------	ML, CL-ML	A-4	0	0-15	80-100	75-100	70-95	50-80	<25	NP-7
	7-31	Loam, fine sandy loam, gravelly sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0-15	80-100	75-100	50-90	45-70	<25	NP-7
	31-70	Sand, gravelly coarse sand, very gravelly sand.	SP, SP-SM	A-1	0	0-15	55-95	45-95	10-35	1-10	---	NP
518---------- Humaquepts	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
519A---------- Monico	0-7	Loam-------------	ML, CL-ML	A-4	0	0-15	85-100	75-100	65-100	50-90	<25	NP-7
	7-19	Fine sandy loam, sandy loam, silt loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0	0-15	55-100	50-98	30-95	15-80	<25	NP-7
	19-46	Fine sandy loam, silt loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	0	0-15	55-100	50-98	30-95	15-80	<25	NP-7
	46-60	Loamy sand-------	SM, SP-SM	A-2, A-1, A-3	0	0-15	90-100	85-100	40-75	0-30	<25	NP-7
520B---------- Haplorthods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
521B---------- Pence	0-4	Sandy loam-------	SM, ML	A-4, A-2, A-1	0	0-7	85-100	75-100	45-85	20-55	<21	NP-4
	4-20	Sandy loam, loam, gravelly sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0	0-7	55-100	50-100	30-95	15-75	<25	NP-7
	20-33	Gravelly sand, loamy sand.	SM, SP-SM, GM, GP-GM	A-2, A-1, A-3	0	0-7	55-100	50-100	25-75	2-30	---	NP
	33-60	Loamy sand, coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2	0	5-15	50-100	50-100	25-70	1-12	---	NP
522D: Entic Fragiorthods---	0-7	Loam-------------	ML, CL-ML	A-4	1-2	0-10	95-100	85-100	70-95	50-75	<25	NP-7
	7-16	Loam, silt loam, gravelly sandy loam.	SM, SC-SM, CL-ML, ML	A-2-4, A-4, A-1-b	0	0-10	95-100	50-100	25-100	10-90	<25	NP-7
	16-26	Gravelly loamy sand, sandy loam, very gravelly sandy loam.	SM, SC-SM, SP-SM, ML	A-2-4, A-4, A-1-b, A-3	0	0-15	80-100	45-90	25-70	5-55	<25	NP-6
	26-60	Gravelly loamy sand, gravelly sandy loam, very gravelly sandy loam.	SM, SC-SM, SP-SM, ML	A-2, A-4, A-1-b, A-3	0	0-15	80-100	45-70	25-70	5-55	<25	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
522D:												
Typic Dystrochrepts--	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
523B:												
Entic Haplorthods----	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
Typic Haplaquepts----	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
524D, 524F-------	0-20	Variable---------	---	---	---	---	---	---	---	---	---	---
Haplorthods	20-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
525B, 525D, 525F-Entic Haplorthods	0-5	Cobbly sandy loam	SM, SC-SM	A-2-4, A-4, A-1-b	0-3	10-50	95-100	85-100	45-85	20-50	<20	NP-4
	5-18	Gravelly sandy loam, cobbly silt loam.	SM, SC-SM, CL-ML, ML	A-4, A-2-4, A-1-b	0-3	10-50	95-100	50-75	30-75	10-70	<25	NP-7
	18-52	Extremely cobbly coarse sand, very cobbly sand.	SP, SP-SM, SM	A-1, A-2, A-3	0-3	55-75	85-95	60-90	40-75	0-30	---	NP
	52-65	Extremely cobbly coarse sand, very cobbly sand.	SP, SM, SP-SM	A-1, A-3, A-2	0-3	55-75	85-95	60-90	40-75	0-30	---	NP
527:												
Borohemists-----	0-51	Mucky peat-------	PT	A-8	---	---	---	---	---	---	---	---
	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
Borosaprists----	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
528--------------	0-51	Mucky peat-------	PT	A-8	---	---	---	---	---	---	---	---
Borohemists	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
529--------------	0-51	Hemic material---	PT	A-8	---		---	---	---	---	---	---
Borohemists	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
530:												
Borosaprists----	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
530:												
Histic Humaquepts-----	0-15	Muck----------	PT	A-8	---	---	---	---	---	---	---	---
	15-60	Variable---------	---	---	---	---	---	---	---	---	---	---
531C---------- Champion	0-2	Silt loam--------	ML, CL-ML	A-4	2-3	10-25	95-100	85-100	75-100	55-90	<25	NP-7
	2-29	Cobbly fine sandy loam, silt loam, fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	
	29-60	Cobbly sandy loam, cobbly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	25-80	10-50	<25	NP-6
532F:												
Champion--------	0-2	Silt loam--------	ML, CL-ML	A-4	2-3	10-25	95-100	85-100	75-100	55-90	<25	NP-7
	2-29	Cobbly silt loam, silt loam, fine sandy loam.	SM, CL-ML, ML, SC-SM	A-2-4, A-4	0-1	0-5	95-100	85-100	55-100	30-90	<25	
	29-60	Cobbly sandy loam, cobbly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-1	0-5	75-100	55-90	20-80	10-50	<25	NP-6
Haplorthods-----	0-20	Variable---------	---	---	---	---	---	---	---	---	---	---
	20-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
533B---------- Entic Fragiorthods	0-4	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0-10	95-100	85-100	70-100	40-90	<25	NP-7
	4-21	Very fine sandy loam, silt loam, gravelly sandy loam.	SM, SC-SM, CL-ML, ML	A-2-4, A-4, A-1-b	0	0-10	95-100	50-100	25-100	10-90	<25	NP-7
	21-35	Gravelly loamy sand, gravelly sandy loam, very gravelly sandy loam.	SM, SC-SM, SP-SM, ML	A-2-4, A-4, A-1-b, A-3	0	0-15	80-100	45-90	25-70	5-55	<25	NP-6
	35-60	Gravelly loamy sand, gravelly fine sandy loam, very gravelly sandy loam.	SM, SC-SM, SP-SM, ML	A-2, A-4, A-1-b, A-3	0	0-15	80-100	45-70	25-70	5-55	<25	NP-6

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
534B, 534D-------	0-1	Sandy loam--------	SM, SC-SM	A-2, A-4	0	0-5	95-100	90-100	70-90	25-50	<25	2-7
Entic Haplorthods	1-6	Sandy loam, loamy sand, sand.	SP-SM, SM, ML	A-2, A-4	0	0-5	90-100	75-100	60-100	10-55	<20	NP-4
	6-41	Loamy sand, sand, fine sand.	SP-SM, SM	A-1, A-2, A-3	0	0-5	95-100	90-100	45-75	5-25	---	NP
	41-60	Stratified loamy fine sand to coarse sand.	SP-SM, SM, SP	A-2, A-1, A-4	0	0-5	90-100	75-100	45-100	0-40	---	NP-4
535B, 535D-------	0-2	Loamy sand--------	SM, SP-SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
Vilas	2-30	Loamy sand--------	SP-SM, SM	A-1, A-2	0	0	80-100	75-100	35-90	12-30	---	NP
	30-42	Sand--------------	SM, SP-SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	5-20	---	NP
	42-95	Sand--------------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	80-100	75-100	35-90	1-20	---	NP
536F--------------	0-6	Silt loam---------	CL, CL-ML	A-4, A-6	0-3	0-15	95-100	85-100	75-100	50-90	20-35	5-15
Entic Haplorthods	6-18	Gravelly sandy loam, gravelly silt loam.	SM, SC-SM, CL-ML, ML	A-2-4, A-4, A-1-b	0-3	0-15	95-100	55-85	35-80	10-75	<25	NP-7
	18-29	Very gravelly coarse sand, extremely gravelly sand.	SP, SP-SM, GP, GM	A-1	0-3	5-15	40-85	15-50	15-40	0-15	---	NP
	29-60	Very gravelly coarse sand, extremely gravelly sand.	SP, SP-SM, GP, GM	A-1	0-3	5-15	40-85	15-50	15-40	0-15	---	NP
537B--------------	0-60	Variable----------	---	---	---	---	---	---	---	---	---	---
Haplorthods												
538B, 538D-------	0-40	Variable----------	---	---	---	---	---	---	---	---	---	---
Entic Haplorthods	40-60	Sand, loamy sand	SP, SP-SM, SM	A-1, A-2, A-3	0	0	80-100	75-100	35-75	0-30	---	NP
539B--------------	0-1	Sandy loam--------	SM, SC-SM	A-2, A-4	0	0-5	95-100	90-100	70-90	25-50	<25	2-7
Karlin	1-6	Sandy loam, loamy sand.	SP-SM, SM, ML	A-2, A-4	0	0-5	90-100	75-100	60-100	10-55	<20	NP-4
	6-61	Loamy sand, sand, fine sand.	SP-SM, SM	A-1, A-2, A-3	0	0-5	95-100	90-100	45-75	5-25	---	NP
	61-95	Sand, loamy sand	SP-SM, SP	A-1, A-2, A-3	0	0-5	80-100	75-100	30-70	0-10	---	NP
540B:												
Entic Fragiorthods---	0-60	Variable----------	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
540B:												
Typic Fragiaquods----	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
Borosaprists----	0-51	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
	51-60	Variable---------	---	---	---	---	---	---	---	---	---	---
541---------- Fluvaquents	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
542B, 542D, 542F- Gogebic	0-7	Fine sandy loam	SM, SC, SC-SM	A-2, A-4, A-1	0-5	5-20	80-100	75-100	45-85	20-50	<25	NP-10
	7-21	Sandy loam, fine sandy loam, gravelly very fine sandy loam.	SM, ML, CL, SC	A-2, A-4	0-5	5-20	80-100	75-100	35-70	25-65	<25	NP-10
	21-28	Sandy loam, fine sandy loam, loamy fine sand.	SM, ML, SP-SM	A-2, A-4	0-5	5-20	80-100	75-90	35-70	25-60	<25	NP-10
	28-37	Sandy loam, fine sandy loam, gravelly loam.	SC, CL, SM, ML	A-2, A-6, A-4	0-5	5-10	80-100	75-100	35-70	25-65	<25	NP-15
	37-60	Sandy loam, gravelly sandy loam, loamy sand.	SM, SP-SM, ML	A-2, A-4	0-5	5-10	80-100	75-90	35-70	20-60	<25	NP-10
543A---------- Haplaquods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
544C, 544D, 544F, 545B, 545D, 545F, 546C, 546D, 546F, 547B---------- Haplorthods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
548:												
Humaquepts------	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
Terric Borosaprists---	0-40	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
	40-60	Variable---------	---	---	---	---	---	---	---	---	---	---

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
549B, 549D, 549F:												
Karlin----------	0-2	Fine sandy loam	SM, ML	A-4, A-1, A-2	0	0	90-100	75-100	45-85	20-55	<20	NP-4
	2-35	Loamy fine sand, loamy sand, fine sandy loam.	SP-SM, SM, ML	A-2, A-4	0	0	90-100	75-100	60-100	10-55	<20	NP-4
	35-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	35-70	0-15	---	NP
Pence----------	0-4	Fine sandy loam	SM, ML	A-4, A-2, A-1	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-20	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	20-33	Gravelly sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-2, A-1, A-3	0	0-15	55-100	50-100	25-75	2-30	---	NP
	33-60	Gravelly sand, loamy sand, sand.	SP, SM	A-1, A-3, A-2	0	0-15	55-85	50-75	15-55	2-15	---	NP
550---------- Terric Borosaprists	0-40	Sapric material	PT	A-8	---	---	---	---	---	---	---	---
	40-60	Variable---------	---	---	---	---	---	---	---	---	---	---
551A---------- Typic Fragiorthods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
552F---------- Kalkaska	0-1	Sand----------	SP-SM, SM	A-1, A-2, A-3	0	0-5	95-100	90-100	45-75	5-25	---	NP
	1-19	Sand----------	SP-SM, SM	A-2, A-1	0	0-5	95-100	85-100	45-75	5-25	---	NP
	19-58	Sand----------	SP-SM, SM	A-2, A-3, A-1	0	0-5	95-100	85-100	45-75	5-15	---	NP
	58-90	Sand, fine sand, loamy fine sand.	SP, SP-SM, SM	A-2, A-3, A-1	0	0-5	95-100	85-100	45-75	0-15	---	NP
553D---------- Kalkaska	0-4	Loamy sand-------	SM, SP-SM	A-1-b, A-2-4	0	0-5	95-100	85-100	45-75	10-30	---	NP
	4-16	Sand----------	SM, SP-SM	A-1-b, A-2-4, A-3	0	0-5	95-100	85-100	45-75	5-30	---	NP
	16-58	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	85-100	45-70	5-15	---	NP
	58-95	Sand----------	SP, SP-SM, SM	A-1-b, A-2-4, A-3	0	0-5	95-100	85-100	45-70	0-15	---	NP

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
554B---------- Alfic Fragiorthods	0-3	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0-2	0-15	80-100	75-100	50-70	30-40	<25	NP-7
	3-19	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0-2	0-15	80-100	75-100	50-90	30-55	<25	NP-7
	19-30	Loam, gravelly sandy loam, sandy loam.	SM	A-2-4, A-4	0-2	0-25	75-95	70-90	60-80	25-50	<20	NP-2
	30-60	Loam, gravelly sandy loam, loamy sand.	SM	A-2-4, A-4	0-2	0-25	70-95	70-90	50-65	15-50	<20	NP
555B---------- Entic Haplorthods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---
556---------- Haplaquods	0-60	Variable---------	---	---	---	---	---	---	---	---	---	---

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
50:											
Aquents	0-60	---	---	---	---	---	---	---	---	---	---
Histosols	0-51	---	---	0.2-6.0	---	---	---	---	---	---	50-70
	51-60	---	---	---	---	---	---	---			
51:											
Lupton	0-10	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	---	---	5	2	70-90
	10-60	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	---	---			
Cathro	0-7	---	0.28-0.45	0.2-6.0	0.45-0.55	4.5-7.8	---	---	5	2	60-85
	7-26	---	0.15-0.30	0.2-6.0	0.35-0.45	4.5-7.8	---	---			
	26-60	10-30	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low	0.32			
Humaquepts	0-60	---	---	---	---	4.5-7.3	---	---	---	---	---
52:											
Greenwood	0-18	---	0.30-0.40	>6.0	0.55-0.65	3.6-4.4	---	---	5	7	55-75
	18-60	---	0.10-0.25	0.6-6.0	0.45-0.55	3.6-4.4	---	---			
Merwin	0-8	---	0.02-0.20	>6.0	0.55-0.65	3.6-5.5	---	---	5	7	>25
	8-36	---	0.04-0.15	0.6-6.0	0.07-0.19	3.6-7.3	---	---			
	36-60	10-20	1.10-1.20	0.6-6.0	0.35-0.55	3.6-5.5	---	---			
53:											
Waucedah	0-10	---	0.30-0.40	0.2-6.0	0.35-0.45	6.1-7.3	---	---	5	2	20-70
	10-60	6-18	1.50-1.70	0.6-2.0	0.11-0.19	5.6-8.4	Low	0.32			
Cathro	0-7	---	0.28-0.45	0.2-6.0	0.45-0.55	4.5-7.8	---	---	5	2	60-85
	7-26	---	0.15-0.30	0.2-6.0	0.35-0.45	4.5-7.8	---	---			
	26-60	10-30	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low	0.32			
54. Pits											
55A, 55B, 55D---- Oconto	0-7	6-13	1.35-1.70	0.6-2.0	0.20-0.22	6.1-7.8	Low	0.37	4	3	1-2
	7-35	8-18	1.40-1.65	0.6-2.0	0.10-0.19	6.1-7.8	Low	0.24			
	35-60	0-3	1.50-1.80	>6.0	0.02-0.07	7.4-8.4	Low	0.15			
56. Pits and dumps											
57A, 57B, 57D, 57F---- Padus	0-7	3-10	1.35-1.70	0.6-6.0	0.10-0.15	4.5-6.5	Low	0.24	4	3	.5-2
	7-39	5-18	1.40-1.65	0.6-6.0	0.09-0.22	4.5-6.5	Low	0.24			
	39-60	0-3	1.55-1.80	>6.0	0.02-0.06	5.1-6.5	Low	0.10			
58B, 58D---- Trenary	0-4	2-15	1.35-1.55	2.0-6.0	0.14-0.22	5.1-6.5	Low	0.17	5	3	1-3
	4-12	2-15	1.35-1.55	2.0-6.0	0.14-0.22	5.1-7.3	Low	0.24			
	12-23	5-15	1.40-1.70	0.6-2.0	0.08-0.14	5.1-7.3	Low	0.24			
	23-36	10-25	1.40-1.80	0.6-2.0	0.14-0.20	5.1-7.8	Low	0.32			
	36-60	5-18	1.40-1.80	0.6-2.0	0.07-0.19	6.6-8.4	Low	0.24			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
59A	0-6	5-20	1.35-1.55	0.6-2.0	0.16-0.24	6.6-7.8	Low	0.32	5	5	1-3
Solona	6-36	12-18	1.45-1.65	0.6-2.0	0.09-0.19	6.6-7.8	Low	0.24			
	36-60	5-20	1.45-1.70	0.6-2.0	0.08-0.19	7.4-8.4	Low	0.37			
60D:											
Trenary	0-4	2-15	1.35-1.55	2.0-6.0	0.14-0.18	5.1-6.5	Low	0.17	5	3	1-3
	4-12	2-15	1.35-1.60	2.0-6.0	0.14-0.19	5.1-7.3	Low	0.24			
	12-23	5-15	1.40-1.70	0.6-2.0	0.08-0.14	5.1-7.3	Low	0.24			
	23-36	10-25	1.40-1.80	0.6-2.0	0.14-0.20	5.1-7.8	Low	0.32			
	36-60	5-18	1.40-1.80	0.6-2.0	0.09-0.19	6.6-8.4	Low	0.24			
Rock outcrop	0-60	---	---	0.01-0.06	---	---		---	---	---	---
64A	0-7	2-12	1.10-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.24	4	3	1-3
Channing	7-24	2-15	1.25-1.70	0.6-2.0	0.11-0.16	4.5-6.0	Low	0.24			
	24-60	0-5	1.50-1.65	>20	0.02-0.04	5.1-6.5	Low	0.10			
65	0-5	---	0.15-0.40	0.2-6.0	0.35-0.45	4.5-6.0	Low	---	5	5	40-70
Witbeck	5-18	5-25	1.25-1.60	0.6-2.0	0.08-0.16	4.5-6.0	Low	0.24			
	18-51	5-20	1.55-1.75	0.6-2.0	0.04-0.18	4.5-6.0	Low	0.24			
	51-60	5-20	1.55-1.75	0.2-2.0	0.04-0.17	5.1-6.5	Low	0.24			
67B	0-3	2-12	1.30-1.60	0.6-2.0	0.08-0.12	3.6-6.0	Low	0.17	4	5	2-6
Net	3-28	2-12	1.40-1.65	0.6-2.0	0.09-0.21	3.6-6.0	Low	0.28			
	28-49	2-10	1.80-2.05	<0.06	0.01-0.02	3.6-6.0	Low	0.20			
	49-60	2-10	1.30-1.70	0.6-6.0	0.01-0.02	5.1-6.5	Low	0.20			
68B:											
Net	0-3	2-12	1.30-1.60	0.6-2.0	0.12-0.16	3.6-6.0	Low	0.28	4	5	2-6
	3-28	2-12	1.40-1.65	0.6-2.0	0.09-0.21	3.6-6.0	Low	0.28			
	28-49	2-10	1.80-2.05	<0.06	0.01-0.02	3.6-6.0	Low	0.20			
	49-60	2-10	1.30-1.70	0.6-6.0	0.01-0.02	5.1-6.5	Low	0.20			
Witbeck	0-5	---	0.15-0.40	0.2-6.0	0.35-0.45	4.5-6.0	Low	---	5	5	40-70
	5-18	5-25	1.25-1.60	0.6-2.0	0.08-0.16	4.5-6.0	Low	0.24			
	18-51	5-20	1.55-1.75	0.6-2.0	0.04-0.18	4.5-6.0	Low	0.24			
	51-60	5-20	1.55-1.75	0.2-2.0	0.04-0.17	5.1-6.5	Low	0.24			
69A:											
Karlin	0-2	5-15	1.35-1.60	2.0-6.0	0.15-0.17	3.6-6.5	Low	0.24	4	3	.5-2
	2-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low	0.15			
Croswell	0-1	0-10	1.30-1.55	6.0-20	0.06-0.09	3.6-6.5	Low	0.15	5	1	.5-2
	1-20	0-10	1.40-1.60	6.0-20	0.06-0.10	4.5-7.3	Low	0.15			
	20-60	0-10	1.50-1.65	6.0-20	0.05-0.07	5.1-8.4	Low	0.15			
70B:											
Sundog	0-4	3-12	1.30-1.60	0.6-2.0	0.18-0.22	5.1-6.0	Low	0.37	4	3	1-3
	4-15	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low	0.28			
	15-22	3-12	1.35-1.70	0.6-2.0	0.13-0.19	5.1-6.0	Low	0.32			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low	0.10			
Channing	0-7	2-12	1.10-1.65	0.6-2.0	0.07-0.18	4.5-6.0	Low	0.17	4	3	1-3
	7-24	2-15	1.25-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low	0.24			
	24-60	0-5	1.50-1.65	>20	0.02-0.04	5.1-6.5	Low	0.10			
71D:											
Karlin	0-3	10-15	1.35-1.60	2.0-6.0	0.14-0.18	3.6-6.5	Low	0.17	4	3	.5-2
	3-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low	0.15			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
71D:											
Vilas	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-6.5	Low	0.17	5	2	<1
	4-17	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low	0.17			
	17-24	1-3	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low	0.17			
	24-60	0-3	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low	0.17			
Rock outcrop	0-60	---	---	0.01-0.06	---	---	---	---	---	---	---
72B, 72D, 72F	0-3	12-15	1.35-1.60	2.0-6.0	0.15-0.17	3.6-6.5	Low	0.24	4	3	.5-2
Karlin	3-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low	0.15			
73A	0-4	10-18	1.40-1.60	0.6-2.0	0.20-0.24	4.5-6.5	Low	0.28	5	5	3-4
Gaastra	4-22	6-18	1.40-1.60	0.6-2.0	0.15-0.22	5.1-6.5	Low	0.37			
	22-51	10-18	1.45-1.70	0.2-0.6	0.15-0.22	4.5-6.5	Low	0.37			
	51-60	10-18	1.50-1.70	0.2-0.6	0.14-0.22	5.1-7.3	Low	0.37			
74A	0-3	0-8	1.30-1.55	6.0-20	0.07-0.10	3.6-7.3	Low	0.15	5	1	2-4
Au Gres	3-32	1-15	1.50-1.70	6.0-20	0.06-0.09	4.5-7.3	Low	0.15			
	32-60	0-8	1.50-1.70	6.0-20	0.05-0.07	5.1-7.3	Low	0.15			
75	0-5	---	0.10-0.35	2.0-6.0	0.35-0.45	3.6-5.0	---	---	5	2	20-70
Kinross	5-52	0-10	1.40-1.70	6.0-20	0.04-0.09	3.6-6.0	Low	0.15			
	52-60	0-10	1.40-1.70	6.0-20	0.04-0.06	4.5-6.5	Low	0.15			
76	0-9	10-15	1.30-1.60	2.0-6.0	0.10-0.18	6.1-7.8	Low	0.17	5	3	3-6
Ensley	9-20	10-18	1.30-1.70	0.6-2.0	0.11-0.18	6.6-8.4	Moderate	0.28			
	20-60	8-18	1.45-1.70	0.6-6.0	0.10-0.14	7.4-8.4	Low	0.28			
77B, 77D	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-6.5	Low	0.17	5	2	<1
Vilas	4-17	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low	0.17			
	17-24	1-3	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low	0.17			
	24-60	0-3	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low	0.17			
78B, 78D, 78F:											
Vilas	0-4	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-6.5	Low	0.17	5	2	<1
	4-17	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low	0.17			
	17-24	1-3	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low	0.17			
	24-60	0-3	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low	0.17			
Karlin	0-3	12-15	1.35-1.60	2.0-6.0	0.15-0.17	3.6-6.5	Low	0.24	4	3	.5-2
	3-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low	0.15			
79A, 79B, 79D	0-2	8-20	1.20-1.35	0.6-2.0	0.22-0.24	3.6-6.5	Low	0.37	5	5	1-2
Fence	2-9	5-18	1.50-1.60	0.2-0.6	0.11-0.22	3.6-6.5	Low	0.37			
	9-41	8-18	1.50-1.60	0.2-0.6	0.17-0.22	3.6-6.5	Low	0.37			
	41-60	5-15	1.50-1.60	0.2-0.6	0.17-0.22	4.5-7.8	Low	0.37			
80B, 80D, 80F	0-4	3-11	1.20-1.65	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.24	3	3	1-3
Pence	4-20	2-12	1.35-1.45	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.24			
	20-33	2-10	1.65-1.75	2.0-20	0.05-0.08	4.5-6.5	Low	0.10			
	33-60	0-4	1.35-1.80	>6.0	0.02-0.05	5.1-6.5	Low	0.10			
82B, 82D, 82F	0-1	2-15	1.35-1.60	2.0-6.0	0.09-0.12	4.5-6.5	Low	0.17	5	2	.5-2
Keweenaw	1-23	2-15	1.45-1.80	2.0-6.0	0.08-0.11	4.5-6.5	Low	0.17			
	23-33	0-15	1.50-1.80	2.0-6.0	0.05-0.11	4.5-6.5	Low	0.17			
	33-39	0-15	1.50-1.80	0.6-6.0	0.06-0.14	4.5-6.5	Low	0.17			
	39-60	2-15	1.50-1.70	2.0-6.0	0.04-0.13	5.1-6.5	Low	0.17			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
100B, 100D:											
Keweenaw---------	0-1	2-15	1.35-1.60	2.0-6.0	0.09-0.12	4.5-6.5	Low----------	0.17	5	2	.5-2
	1-23	2-15	1.45-1.80	2.0-6.0	0.08-0.11	4.5-6.5	Low----------	0.17			
	23-33	0-15	1.50-1.80	2.0-6.0	0.05-0.11	4.5-6.5	Low----------	0.17			
	33-39	0-15	1.50-1.80	0.6-6.0	0.06-0.14	4.5-6.5	Low----------	0.17			
	39-60	2-15	1.50-1.70	2.0-6.0	0.04-0.13	5.1-6.5	Low----------	0.17			
Karlin----------	0-3	12-15	1.35-1.60	2.0-6.0	0.15-0.17	3.6-6.5	Low----------	0.24	4	3	.5-2
	3-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low----------	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low----------	0.15			
101B:											
Trenary---------	0-4	2-15	1.35-1.55	2.0-6.0	0.14-0.22	5.1-6.5	Low----------	0.17	5	3	1-3
	4-12	2-15	1.35-1.55	2.0-6.0	0.14-0.22	5.1-7.3	Low----------	0.24			
	12-23	5-15	1.40-1.70	0.6-2.0	0.08-0.14	5.1-7.3	Low----------	0.24			
	23-36	10-25	1.40-1.80	0.6-2.0	0.14-0.20	5.1-7.8	Low----------	0.32			
	36-60	5-18	1.40-1.80	0.6-2.0	0.07-0.19	6.6-8.4	Low----------	0.24			
Solona----------	0-6	5-20	1.35-1.55	0.6-2.0	0.16-0.24	6.6-7.8	Low----------	0.32	5	5	1-3
	6-36	12-18	1.45-1.65	0.6-2.0	0.09-0.19	6.6-7.8	Low----------	0.24			
	36-60	5-20	1.45-1.70	0.6-2.0	0.08-0.19	7.4-8.4	Low----------	0.37			
102B----------	0-1	0-15	1.35-1.65	2.0-6.0	0.09-0.12	5.1-6.5	Low----------	0.17	5	2	.5-3
Escanaba	1-24	0-15	1.30-1.65	2.0-6.0	0.08-0.11	5.1-7.3	Low----------	0.17			
	24-36	5-15	1.30-1.65	2.0-6.0	0.09-0.11	5.1-7.3	Low----------	0.17			
	36-49	7-20	1.30-1.70	0.6-2.0	0.12-0.17	6.6-7.8	Low----------	0.28			
	49-60	4-20	1.30-1.70	0.6-2.0	0.10-0.16	6.6-7.8	Low----------	0.28			
103B, 103D:											
Wabeno----------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.18-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.17			
	50-60	3-10	1.80-1.95	0.6-6.0	0.03-0.05	4.5-6.5	Low----------	0.20			
Sarona----------	0-2	4-15	1.35-1.65	0.6-2.0	0.08-0.15	4.5-6.5	Low----------	0.17	5	3	1-3
	2-33	4-12	1.55-1.65	0.6-2.0	0.07-0.17	4.5-6.5	Low----------	0.24			
	33-37	5-12	1.60-1.70	0.6-2.0	0.08-0.19	4.5-6.5	Low----------	0.24			
	37-60	4-15	1.60-1.70	0.6-2.0	0.05-0.13	5.1-6.5	Low----------	0.24			
104A, 104B, 104D-	0-4	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.28	4	5	1-3
Stambaugh	4-18	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.43			
	18-39	8-18	1.25-1.70	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.43			
	39-60	0-8	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.10			
105D:											
Wabeno----------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.12-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.28			
	50-60	3-10	1.80-1.95	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.28			
Rock outcrop----	0-60	---	---	0.01-0.06	---	---	----------	----	---	---	---
106D----------	0-4	2-15	1.10-1.65	0.6-2.0	0.07-0.20	3.6-6.0	Low----------	0.28	4	3	1-3
Champion	4-20	2-15	1.10-1.65	0.6-2.0	0.09-0.20	3.6-6.0	Low----------	0.37			
	20-49	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low----------	0.20			
	49-60	1-12	1.30-1.65	0.6-6.0	0.01-0.04	3.6-6.0	Low----------	0.20			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
107B, 107D, 107F-Sarona	0-2	4-15	1.35-1.65	0.6-2.0	0.08-0.15	4.5-6.5	Low	0.17	5	3	1-3
	2-33	4-12	1.55-1.65	0.6-2.0	0.07-0.17	4.5-6.5	Low	0.24			
	33-37	5-12	1.60-1.70	0.6-2.0	0.08-0.19	4.5-6.5	Low	0.24			
	37-60	4-15	1.60-1.70	0.6-2.0	0.05-0.13	5.1-6.5	Low	0.24			
108D, 108F:											
Sarona	0-2	4-15	1.35-1.65	0.6-2.0	0.08-0.15	4.5-6.5	Low	0.17	5	3	1-3
	2-33	4-12	1.55-1.65	0.6-2.0	0.07-0.17	4.5-6.5	Low	0.24			
	33-37	5-12	1.60-1.70	0.6-2.0	0.08-0.19	4.5-6.5	Low	0.24			
	37-60	4-15	1.60-1.70	0.6-2.0	0.05-0.13	5.1-6.5	Low	0.24			
Rock outcrop	0-60	---	---	0.01-0.06	---	---	---	---	---	---	---
109D	0-10	2-18	1.50-1.70	0.6-2.0	0.11-0.18	---	Low	0.24	5	3	---
Udorthents	10-60	---	---	---	---	---	---	---			
110B, 110D:											
Petticoat	0-1	3-15	1.30-1.55	0.6-2.0	0.14-0.20	3.6-6.0	Low	0.28	4	5	1-3
	1-38	3-15	1.40-1.70	0.6-2.0	0.10-0.20	4.5-6.5	Low	0.43			
	38-60	2-10	1.45-1.70	6.0-20	0.04-0.08	5.1-6.5	Low	0.10			
Wabeno	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.12-0.22	3.6-6.0	Low	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low	0.28			
	50-60	3-10	1.80-1.95	0.6-2.0	0.03-0.05	4.5-6.5	Low	0.28			
111B:											
Champion	0-4	2-15	1.10-1.65	0.6-2.0	0.07-0.20	3.6-6.0	Low	0.28	4	3	1-3
	4-20	2-15	1.10-1.65	0.6-2.0	0.09-0.20	3.6-6.0	Low	0.37			
	20-49	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low	0.20			
	49-60	1-12	1.30-1.65	0.6-6.0	0.01-0.04	3.6-6.0	Low	0.20			
Net	0-3	2-12	1.30-1.60	0.6-2.0	0.08-0.12	3.6-6.0	Low	0.17	4	5	2-6
	3-28	2-12	1.40-1.65	0.6-2.0	0.09-0.21	3.6-6.0	Low	0.28			
	28-49	2-10	1.80-2.05	<0.06	0.01-0.02	3.6-6.0	Low	0.20			
	49-60	2-10	1.30-1.70	0.6-6.0	0.01-0.02	5.1-6.5	Low	0.20			
112B, 112D-Sundog	0-4	3-12	1.30-1.60	0.6-2.0	0.18-0.22	5.1-6.0	Low	0.37	4	3	1-3
	4-15	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low	0.28			
	15-22	3-12	1.35-1.70	0.6-2.0	0.13-0.19	5.1-6.0	Low	0.32			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low	0.10			
112F-Sundog	0-4	3-12	1.30-1.60	0.6-2.0	0.15-0.18	5.1-6.0	Low	0.24	4	3	1-3
	4-15	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low	0.28			
	15-22	3-12	1.35-1.70	0.6-2.0	0.13-0.19	5.1-6.0	Low	0.32			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low	0.10			
113A-Sundog	0-2	3-12	1.30-1.60	0.6-2.0	0.19-0.22	5.1-6.0	Low	0.37	4	3	1-3
	2-25	3-15	1.35-1.70	0.6-2.0	0.15-0.22	5.1-6.0	Low	0.28			
	25-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low	0.10			
114A:											
Minocqua	0-4	---	0.15-0.45	2.0-6.0	0.35-0.45	4.5-7.8	Low	0.10	4	2	60-90
	4-25	10-18	1.50-1.60	0.6-2.0	0.11-0.19	4.5-7.8	Low	0.37			
	25-29	3-10	1.65-1.75	2.0-6.0	0.06-0.10	4.5-7.8	Low	0.15			
	29-60	0-3	1.75-1.85	>6.0	0.02-0.04	4.5-7.8	Low	0.10			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
114A:											
Channing--------	0-7	2-12	1.10-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.24	4	3	1-3
	7-24	2-15	1.25-1.70	0.6-2.0	0.11-0.16	4.5-6.0	Low----------	0.24			
	24-60	0-5	1.50-1.65	>20	0.02-0.04	5.1-6.5	Low----------	0.10			
115A----------	0-1	4-10	1.30-1.70	2.0-6.0	0.11-0.18	4.5-6.5	Low----------	0.24	3	3	1-3
Manitowish	1-19	5-15	1.40-1.70	2.0-6.0	0.10-0.19	4.5-6.5	Low----------	0.24			
	19-26	3-12	1.45-1.65	2.0-6.0	0.04-0.12	4.5-6.5	Low----------	0.15			
	26-60	0-3	1.55-1.70	>6.0	0.02-0.07	5.6-6.5	Low----------	0.10			
116B, 116D-------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	6	1-2
Wabeno	2-23	4-12	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.12-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.28			
	50-60	3-10	1.80-1.95	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.28			
121B, 121D-------	0-6	5-10	1.35-1.55	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.28	4	5	1-3
Peavy	6-27	3-10	1.35-1.70	0.6-2.0	0.12-0.22	5.6-6.5	Low----------	0.43			
	27-41	10-18	1.80-2.00	0.06-0.2	0.03-0.04	5.6-6.5	Low----------	0.28			
	41-60	8-15	1.80-2.10	<0.06	0.02-0.03	5.6-6.5	Low----------	0.28			
122B, 122D:											
Sarona----------	0-2	4-15	1.35-1.65	0.6-2.0	0.10-0.18	4.5-6.5	Low----------	0.24	5	3	1-3
	2-33	4-12	1.55-1.65	0.6-2.0	0.07-0.17	4.5-6.5	Low----------	0.24			
	33-37	5-12	1.60-1.70	0.6-2.0	0.06-0.14	4.5-6.5	Low----------	0.24			
	37-60	4-15	1.60-1.70	0.6-2.0	0.06-0.13	5.1-6.5	Low----------	0.24			
Karlin----------	0-2	5-15	1.35-1.60	2.0-6.0	0.14-0.18	3.6-6.5	Low----------	0.17	4	3	.5-2
	2-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low----------	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low----------	0.15			
123B, 123D-------	0-3	2-15	1.30-1.60	6.0-20	0.10-0.12	4.5-6.5	Low----------	0.17	4	2	1-3
Ocqueoc	3-23	0-15	1.30-1.60	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.15			
	23-60	10-27	1.50-1.80	0.2-0.6	0.05-0.21	5.6-7.8	Low----------	0.37			
124B, 125B:											
Wabeno----------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.12-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.28			
	50-60	3-10	1.80-1.95	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.28			
Net----------	0-3	2-12	1.30-1.60	0.6-2.0	0.12-0.16	3.6-6.0	Low----------	0.28	4	5	2-6
	3-28	2-12	1.40-1.65	0.6-2.0	0.09-0.21	3.6-6.0	Low----------	0.28			
	28-49	2-10	1.80-2.05	<0.06	0.01-0.02	3.6-6.0	Low----------	0.20			
	49-60	2-10	1.30-1.70	0.6-6.0	0.01-0.02	5.1-6.5	Low----------	0.20			
126B, 126D, 126F-	0-4	2-15	1.10-1.65	0.6-2.0	0.07-0.20	3.6-6.0	Low----------	0.28	4	3	1-3
Champion	4-20	2-15	1.10-1.65	0.6-2.0	0.09-0.20	3.6-6.0	Low----------	0.37			
	20-49	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low----------	0.20			
	49-60	1-12	1.30-1.65	0.6-6.0	0.01-0.04	3.6-6.0	Low----------	0.20			
127D----------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.37	5	5	2-4
Goodman	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.43			
	5-14	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	14-33	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	33-49	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.28			
	49-60	2-12	1.50-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low----------	0.28			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
128B:											
Goodman----------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.37	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.43			
	5-14	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	14-33	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	33-49	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.28			
	49-60	2-12	1.50-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low----------	0.28			
Wabeno----------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.18-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.17			
	50-60	3-10	1.80-1.95	0.6-6.0	0.03-0.05	4.5-6.5	Low----------	0.20			
Sundog----------	0-3	3-12	1.30-1.60	0.6-2.0	0.19-0.22	5.1-6.0	Low----------	0.28	4	3	1-3
	3-46	3-12	1.35-1.70	0.6-2.0	0.15-0.22	5.1-6.0	Low----------	0.43			
	46-60	0-5	1.55-1.65	6.0-20	0.02-0.04	5.6-6.0	Low----------	0.10			
128D:											
Goodman----------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.37	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.43			
	5-14	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	14-33	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	33-49	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.28			
	49-60	2-12	1.50-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low----------	0.28			
Wabeno----------	0-2	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	5	1-2
	2-23	4-12	1.30-1.45	0.6-2.0	0.18-0.24	3.6-6.0	Low----------	0.43			
	23-32	6-16	1.65-1.80	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43			
	32-50	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.17			
	50-60	3-10	1.80-1.95	0.6-6.0	0.03-0.05	4.5-6.5	Low----------	0.20			
Sundog----------	0-3	3-12	1.30-1.60	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.37	4	3	1-3
	3-46	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low----------	0.28			
	46-60	3-12	1.35-1.70	0.6-2.0	0.13-0.19	5.1-6.0	Low----------	0.32			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low----------	0.10			
128F:											
Goodman----------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.37	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.43			
	5-14	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	14-33	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43			
	33-49	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.28			
	49-60	2-12	1.50-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low----------	0.28			
Sundog----------	0-4	3-12	1.30-1.60	0.6-2.0	0.15-0.18	5.1-6.0	Low----------	0.24	4	3	1-3
	4-22	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low----------	0.28			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low----------	0.10			
163B, 163D, 163F- Sagola	0-3	2-15	1.30-1.60	2.0-6.0	0.14-0.18	5.1-6.5	Low----------	0.24	5	3	1-3
	3-18	2-15	1.20-1.55	2.0-6.0	0.08-0.17	5.1-6.5	Low----------	0.17			
	18-47	2-15	1.20-1.55	2.0-6.0	0.08-0.17	6.6-7.8	Low----------	0.17			
	47-60	2-15	1.40-1.80	2.0-6.0	0.08-0.13	6.6-7.8	Low----------	0.17			
164B---------- Alstad	0-4	7-18	1.35-1.60	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	5	2-5
	4-21	6-16	1.55-1.65	0.6-2.0	0.13-0.22	4.5-7.3	Low----------	0.32			
	21-26	11-30	1.55-1.70	0.6-2.0	0.13-0.21	5.1-7.3	Low----------	0.32			
	26-42	18-35	1.55-1.70	0.6-2.0	0.13-0.19	5.1-7.8	Low----------	0.32			
	42-60	8-35	1.60-1.80	0.2-0.6	0.09-0.19	5.6-8.4	Low----------	0.32			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
165B:											
Sundog----------	0-4	3-12	1.30-1.60	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.37	4	3	1-3
	4-15	3-15	1.35-1.70	0.6-2.0	0.14-0.22	5.1-6.0	Low----------	0.28			
	15-22	3-12	1.35-1.70	0.6-2.0	0.13-0.19	5.1-6.0	Low----------	0.32			
	22-60	0-5	1.55-1.65	>20	0.02-0.04	5.6-6.0	Low----------	0.10			
Channing--------	0-7	2-12	1.10-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.24	4	3	1-3
	7-24	2-15	1.25-1.70	0.6-2.0	0.11-0.16	4.5-6.0	Low----------	0.24			
	24-60	0-5	1.50-1.65	>20	0.02-0.04	5.1-6.5	Low----------	0.10			
166F----------	0-1	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-6.5	Low----------	0.37	4	5	2-3
Soperton	1-25	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.5	Low----------	0.43			
	25-41	6-16	1.80-1.95	0.06-0.6	0.06-0.12	3.6-6.5	Low----------	0.17			
	41-60	3-10	1.80-1.95	0.6-6.0	0.04-0.10	4.5-6.5	Low----------	0.10			
167A----------	0-4	8-15	1.10-1.40	0.6-2.0	0.18-0.24	4.5-6.5	Low----------	0.37	5	5	1-4
Monico	4-7	3-18	1.65-1.75	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24			
	7-47	2-8	1.70-1.80	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.17			
	47-60	2-8	1.70-1.80	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.10			
168F:											
Soperton--------	0-1	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-6.5	Low----------	0.37	4	5	2-3
	1-25	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.5	Low----------	0.43			
	25-41	6-16	1.80-1.95	0.06-0.6	0.06-0.12	3.6-6.5	Low----------	0.17			
	41-60	3-10	1.80-1.95	0.6-6.0	0.04-0.10	4.5-6.5	Low----------	0.10			
Rock outcrop----	0-60	---	---	0.01-0.06	---	---	----------	----	---	---	---
500B, 500D-------	0-3	3-10	1.20-1.50	0.6-2.0	0.18-0.23	3.6-6.0	Low----------	0.37	4	6	1-2
Wabeno	3-19	4-12	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.43			
	19-63	6-16	1.80-1.95	0.2-0.6	0.08-0.12	3.6-6.0	Low----------	0.28			
	63-72	3-10	1.80-1.95	0.6-2.0	0.03-0.05	4.5-6.5	Low----------	0.28			
501F----------	0-1	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-6.5	Low----------	0.37	4	5	2-3
Soperton	1-25	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.5	Low----------	0.43			
	25-41	6-16	1.80-1.95	0.06-0.6	0.06-0.12	3.6-6.5	Low----------	0.17			
	41-60	3-10	1.80-1.95	0.6-6.0	0.04-0.10	4.5-6.5	Low----------	0.10			
502B, 502D, 502F-	0-4	2-15	1.10-1.65	0.6-2.0	0.07-0.20	3.6-6.0	Low----------	0.28	4	3	1-3
Champion	4-20	2-15	1.10-1.65	0.6-2.0	0.09-0.20	3.6-6.0	Low----------	0.37			
	20-49	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low----------	0.20			
	49-60	1-12	1.30-1.65	0.6-6.0	0.01-0.04	3.6-6.0	Low----------	0.20			
503A----------	0-7	5-13	1.10-1.60	0.6-2.0	0.17-0.22	3.6-5.5	Low----------	0.32	3	5	1-3
Typic	7-15	2-13	1.10-1.60	0.6-2.0	0.10-0.22	3.6-5.5	Low----------	0.32			
Fragiaquods	15-38	5-15	1.75-2.05	<0.06	0.02-0.04	3.6-5.5	Low----------	0.32			
	38-60	1-8	1.30-1.70	0.6-2.0	0.02-0.04	5.1-6.5	Low----------	0.32			
504B, 504D, 504F-	0-2	3-11	1.20-1.65	2.0-6.0	0.10-0.18	4.5-6.5	Low----------	0.24	3	3	1-3
Pence	2-20	2-12	1.35-1.45	2.0-6.0	0.10-0.15	4.5-6.5	Low----------	0.24			
	20-35	2-10	1.65-1.75	2.0-20	0.05-0.08	4.5-6.5	Low----------	0.10			
	35-60	0-4	1.35-1.80	>6.0	0.02-0.05	5.1-6.5	Low----------	0.10			
505----------	0-60	---	---	---	---	3.6-4.4	----------	----	---	---	---
Humaquepts											
506----------	0-60	---	---	---	---	4.5-7.3	----------	----	---	---	---
Humaquepts											

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
507A----------	0-4	8-15	1.10-1.40	0.6-2.0	0.18-0.24	4.5-6.5	Low----------	0.37	5	5	1-4
Monico	4-7	3-18	1.65-1.75	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24			
	7-47	2-8	1.70-1.80	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.17			
	47-60	2-8	1.70-1.80	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.10			
508A----------	0-4	6-16	1.10-1.40	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.37	5	5	2-4
Beechwood	4-34	6-16	1.10-1.40	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.37			
	34-49	6-16	1.30-1.65	0.6-2.0	0.10-0.22	4.5-5.5	Low----------	0.37			
	49-71	5-8	1.70-1.90	0.6-2.0	0.05-0.12	5.1-6.5	Low----------	0.24			
509A----------	0-2	5-26	1.30-1.60	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.37	5	5	2-3
Typic	2-60	4-12	1.35-1.65	0.6-2.0	0.12-0.22	4.5-6.0	Low----------	0.24			
Dystrochrepts	60-72	4-12	1.55-1.70	0.6-2.0	0.11-0.22	5.1-6.5	Low----------	0.24			
510----------	0-51	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
Borosaprists	51-60	---	---	---	---	---	----------	----			
511B, 511D, 511F-	0-3	8-15	1.30-1.65	2.0-6.0	0.12-0.18	4.5-5.5	Low----------	0.24	5	3	2-3
Typic	3-41	4-12	1.35-1.65	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.24			
Dystrochrepts	41-60	1-8	1.50-1.70	6.0-20	0.02-0.05	5.1-6.5	Low----------	0.15			
512----------	0-51	---	---	0.2-6.0	---	3.6-4.4	----------	----	2	2	---
Borosaprists	51-60	---	---	---	---	---	----------	----			
513B----------	0-2	8-13	1.10-1.60	0.6-2.0	0.10-0.18	3.6-5.5	Low----------	0.24	5	3	1-3
Entic	2-30	8-20	1.10-1.60	0.6-2.0	0.10-0.18	3.6-5.5	Low----------	0.24			
Haplorthods	30-60	0-10	1.35-1.45	6.0-20	0.03-0.06	5.1-6.5	Low----------	0.15			
514B----------	0-8	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.28	4	5	1-3
Stambaugh	8-23	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.43			
	23-44	8-18	1.25-1.70	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.43			
	44-60	0-8	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.10			
515----------	0-51	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
Borosaprists	51-60	---	---	---	---	---	----------	----			
516B, 516D-------	0-60	---	---	---	---	---	----------	----	---	---	---
Fragiorthods											
517B, 517D, 517F-	0-7	5-12	1.10-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.37	4	5	.5-2
Lode	7-31	5-12	1.10-1.40	0.6-2.0	0.10-0.19	4.5-6.0	Low----------	0.24			
	31-70	0-7	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.15			
518----------	0-60	---	---	---	---	4.5-7.3	----------	----	---	---	---
Humaquepts											
519A----------	0-7	8-15	1.10-1.40	0.6-2.0	0.18-0.24	4.5-6.5	Low----------	0.37	5	5	1-4
Monico	7-19	3-18	1.65-1.75	0.6-2.0	0.09-0.19	4.5-6.5	Low----------	0.24			
	19-46	2-8	1.70-1.80	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.17			
	46-60	2-8	1.70-1.80	0.6-2.0	0.08-0.10	5.1-7.3	Low----------	0.10			
520B----------	0-60	---	---	---	---	---	----------	----	---	---	---
Haplorthods											
521B----------	0-4	3-11	1.20-1.65	2.0-6.0	0.10-0.18	4.5-6.5	Low----------	0.24	3	3	1-3
Pence	4-20	2-12	1.35-1.45	2.0-6.0	0.10-0.15	4.5-6.5	Low----------	0.24			
	20-33	2-10	1.65-1.75	2.0-20	0.05-0.08	4.5-6.5	Low----------	0.10			
	33-60	0-4	1.35-1.80	>6.0	0.02-0.05	5.1-6.5	Low----------	0.10			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
522D:											
Entic Fragiorthods---	0-7	7-15	1.10-1.35	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.32	4	5	1-3
	7-16	2-15	1.25-1.60	0.6-2.0	0.09-0.20	4.5-5.5	Low----------	0.24			
	16-26	1-12	1.80-2.05	<0.06	0.01-0.04	5.6-6.0	Low----------	0.20			
	26-60	1-12	1.40-1.70	0.6-6.0	0.01-0.04	5.6-6.0	Low----------	0.20			
Typic Dystrochrepts--	0-60	---	---	---	---	---	----------	----	---	---	---
523B:											
Entic Haplorthods----	0-60	---	---	---	---	---	----------	----	---	---	---
Typic Haplaquepts----	0-60	---	---	---	---	---	----------	----	---	---	---
524D, 524F-------	0-20	---	---	---	---	---	----------	----	---	---	---
Haplorthods	20-60	---	---	0.01-0.06	---	---	----------	----			
525B, 525D, 525F-	0-5	2-10	1.10-1.35	0.6-2.0	0.08-0.15	4.5-6.0	Low----------	0.28	4	3	1-3
Entic	5-18	2-15	1.25-1.65	0.6-2.0	0.12-0.22	4.5-6.0	Low----------	0.28			
Haplorthods	18-52	0-5	1.30-1.60	6.0-20	0.02-0.07	5.1-6.0	Low----------	0.10			
	52-65	0-5	1.45-1.60	6.0-20	0.02-0.07	5.1-6.0	Low----------	0.10			
527:											
Borohemists-----	0-51	---	---	0.6-6.0	---	3.6-4.4	----------	----	2	2	---
	51-60	---	---	---	---	---	----------	----			
Borosaprists----	0-51	---	---	0.2-6.0	---	3.6-4.4	----------	----	2	2	---
	51-60	---	---	---	---	---	----------	----			
528----------	0-51	---	---	0.6-6.0	---	3.6-4.4	----------	----	2	2	---
Borohemists	51-60	---	---	---	---	---	----------	----			
529----------	0-51	---	---	0.6-6.0	---	4.5-7.3	----------	----	2	2	---
Borohemists	51-60	---	---	---	---	---	----------	----			
530:											
Borosaprists----	0-51	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
	51-60	---	---	---	---	---	----------	----			
Histic Humaquepts-----	0-15	---	---	0.6-6.0	---	---	----------	----	2	2	---
	15-60	---	---	---	---	---	----------	----			
531C----------	0-2	5-15	1.10-1.35	0.6-2.0	0.13-0.22	3.6-6.0	Low----------	0.28	4	5	1-3
Champion	2-29	2-15	1.10-1.65	0.6-2.0	0.09-0.20	3.6-6.0	Low----------	0.37			
	29-60	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low----------	0.20			
532F:											
Champion--------	0-2	5-15	1.10-1.35	0.6-2.0	0.13-0.22	3.6-6.0	Low----------	0.28	4	5	1-3
	2-29	2-15	1.25-1.65	0.6-2.0	0.10-0.20	3.6-6.0	Low----------	0.37			
	29-60	2-12	1.80-2.05	<0.06	0.01-0.04	3.6-6.0	Low----------	0.20			
Haplorthods-----	0-20	---	---	---	---	---	----------	----	---	---	---
	20-60	---	---	0.01-0.06	---	---	----------	----			

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
533B----------	0-4	2-15	1.10-1.35	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.37	4	5	1-3
Entic	4-21	2-15	1.25-1.60	0.6-2.0	0.09-0.20	4.5-5.5	Low----------	0.24			
Fragiorthods	21-35	1-12	1.80-2.05	<0.06	0.01-0.04	5.0-6.0	Low----------	0.20			
	35-60	1-12	1.40-1.70	0.6-6.0	0.01-0.04	5.0-6.0	Low----------	0.20			
534B, 534D-------	0-1	8-20	1.45-1.60	2.0-6.0	0.13-0.22	4.5-5.5	Low----------	0.20	5	3	1-3
Entic	1-6	2-15	1.35-1.60	2.0-6.0	0.08-0.16	4.5-6.5	Low----------	0.17			
Haplorthods	6-41	0-15	1.35-1.60	6.0-20	0.05-0.10	5.1-6.5	Low----------	0.15			
	41-60	0-15	1.35-1.70	2.0-20	0.05-0.10	5.1-6.5	Low----------	----			
535B, 535D-------	0-2	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-6.5	Low----------	0.17	5	2	<1
Vilas	2-30	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17			
	30-42	1-3	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.17			
	42-95	0-3	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low----------	0.17			
536F----------	0-6	12-27	1.40-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.37	3	5	1-3
Entic	6-18	2-15	1.25-1.65	0.6-2.0	0.03-0.08	4.5-6.0	----------	0.28			
Haplorthods	18-29	0-5	1.30-1.60	6.0-20	0.02-0.07	5.1-6.0	----------	0.10			
	29-60	0-5	1.45-1.60	6.0-20	---	5.1-6.0	----------	0.10			
537B----------	0-60	---	---	---	---	---	----------	----	---	---	---
Haplorthods											
538B, 538D-------	0-40	---	---	---	---	---	----------	----	---	---	---
Entic	40-60	1-10	1.55-1.65	>6.0	0.04-0.09	---	Low----------	----			
Haplorthods											
539B----------	0-1	8-20	1.45-1.60	2.0-6.0	0.13-0.22	4.5-5.5	Low----------	0.20	5	3	1-3
Karlin	1-6	2-15	1.35-1.60	2.0-6.0	0.08-0.16	5.1-6.5	Low----------	0.17			
	6-61	0-15	1.35-1.60	6.0-20	0.05-0.10	5.1-6.5	Low----------	0.15			
	61-95	0-15	1.35-1.60	6.0-20	0.02-0.04	5.1-6.5	Low----------	0.10			
540B:											
Entic											
Fragiorthods---	0-60	---	---	---	---	---	----------	----	---	---	---
Typic											
Fragiaquods----	0-60	---	---	---	---	---	----------	----	---	---	---
Borosaprists----	0-51	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
	51-60	---	---	---	---	---	----------	----			
541----------	0-60	---	---	---	---	---	----------	----	---	---	---
Fluvaquents											
542B, 542D, 542F-	0-7	2-15	1.25-1.65	0.6-2.0	0.10-0.18	4.5-6.0	Low----------	0.24	3	3	1-3
Gogebic	7-21	2-15	1.25-1.65	0.6-2.0	0.14-0.21	4.5-6.0	Low----------	0.32			
	21-28	5-18	1.80-2.05	<0.06	0.02-0.04	4.5-6.0	Low----------	0.28			
	28-37	10-18	1.50-1.80	0.6-2.0	0.02-0.04	4.5-6.0	Low----------	0.28			
	37-60	2-15	1.30-1.70	0.6-2.0	0.02-0.04	5.6-7.3	Low----------	0.28			
543A----------	0-60	---	---	---	---	---	----------	----	---	---	---
Haplaquods											

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
544C, 544D, 544F, 545B, 545D, 545F, 546C, 546D, 546F, 547B---------- Haplorthods	0-60	---	---	---	---	---	----------	----	---	---	---
548: Humaquepts------	0-60	---	---	---	---	4.5-7.3	----------	----	---	---	---
Terric Borosaprists---	0-40	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
	40-60	---	---	---	---	---	----------	----			
549B, 549D, 549F: Karlin----------	0-2	5-15	1.35-1.60	2.0-6.0	0.15-0.17	3.6-6.5	Low----------	0.24	4	3	.5-2
	2-35	2-15	1.35-1.60	2.0-6.0	0.08-0.16	3.6-6.5	Low----------	0.17			
	35-60	0-10	1.40-1.70	6.0-20	0.03-0.04	5.6-7.3	Low----------	0.15			
Pence----------	0-4	3-11	1.20-1.65	2.0-6.0	0.10-0.18	4.5-6.5	Low----------	0.24	3	3	1-3
	4-20	2-12	1.35-1.45	2.0-6.0	0.10-0.15	4.5-6.5	Low----------	0.24			
	20-33	2-10	1.65-1.75	2.0-20	0.05-0.08	4.5-6.5	Low----------	0.10			
	33-60	0-4	1.35-1.80	>6.0	0.02-0.05	5.1-6.5	Low----------	0.10			
550----------	0-40	---	---	0.2-6.0	---	4.5-7.3	----------	----	2	2	---
Terric Borosaprists	40-60	---	---	---	---	---	----------	----			
551A---------- Typic Fragiorthods	0-60	---	---	---	---	---	----------	----	---	---	---
552F----------	0-1	0-15	1.25-1.45	6.0-20	0.06-0.08	4.5-5.5	Low----------	0.15	5	1	.5-4
Kalkaska	1-19	0-15	1.35-1.45	6.0-20	0.06-0.08	4.5-6.0	Low----------	0.15			
	19-58	0-10	1.35-1.45	6.0-20	0.06-0.08	4.5-6.0	Low----------	0.15			
	58-90	0-10	1.40-1.65	2.0-20	0.06-0.12	5.1-6.0	Low----------	0.15			
553D----------	0-4	0-15	1.25-1.45	6.0-20	0.09-0.12	3.6-6.0	Low----------	0.17	5	2	1-4
Kalkaska	4-16	0-15	1.35-1.45	6.0-20	0.06-0.08	3.6-6.0	Low----------	0.15			
	16-58	0-10	1.35-1.45	6.0-20	0.06-0.08	4.5-6.0	Low----------	0.15			
	58-95	0-10	1.35-1.50	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
554B----------	0-3	2-13	1.10-1.60	0.6-2.0	0.10-0.18	3.6-5.5	Low----------	0.24	3	3	1-3
Alfic Fragiorthods	3-19	2-13	1.10-1.60	0.6-2.0	0.10-0.22	3.6-5.5	Low----------	0.32			
	19-30	3-12	1.80-2.10	<0.06	0.06-0.08	5.1-6.0	Low----------	0.32			
	30-60	1-10	1.50-1.70	2.0-6.0	0.02-0.05	5.1-6.5	Low----------	0.32			
555B---------- Entic Haplorthods	0-60	---	---	---	---	---	----------	----	---	---	---
556---------- Haplaquods	0-60	---	---	---	---	---	----------	----	---	---	---

TABLE 19.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
50:											
Aquents	D	None	---	---	+1-1.0	Apparent	Jan-Dec	>60	---	---	---
Histosols	D	None	---	---	+1-1.0	Apparent	Jan-Dec	>60	---	---	---
51:											
Lupton	A/D	None	---	---	+1-1.0	Apparent	Sep-May	>60	---	High	Low.
Cathro	A/D	None	---	---	+1-1.0	Apparent	Nov-Jun	>60	---	High	Low.
Humaquepts	D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---
52:											
Greenwood	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High	High.
Merwin	A/D	None	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	High	High.
53:											
Waucedah	D	Frequent	Brief to very long.	Mar-May	+2-1.0	Apparent	Jan-Dec	>60	---	Moderate	Low.
Cathro	D	Frequent	Brief to very long.	Mar-May	+2-1.0	Apparent	Jan-Dec	>60	---	High	Low.
54. Pits											
55A, 55B, 55D--- Oconto	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
56. Pits and dumps											
57A, 57B, 57D, 57F--- Padus	B	None	---	---	>6.0	---	---	>60	---	Low	High.
58B, 58D--- Trenary	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
59A--- Solona	C	None	---	---	1.0-3.0	Apparent	Mar-Jul	>60	---	High	Low.
60D:											
Trenary	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Rock outcrop	---	None	---	---	>6.0	---	---	0-4	Hard	---	---
64A--- Channing	B	None	---	---	0.5-1.5	Apparent	Nov-May	>60	---	Moderate	Moderate.
65--- Witbeck	B/D	None	---	---	+.5-1.0	Apparent	Nov-Jun	>60	---	High	Moderate.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
67B---------- Net	C	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---	Moderate	Moderate.
68B:											
Net----------	C	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---	Moderate	Moderate.
Witbeck----------	B/D	None--------	---	---	+.5-1.0	Apparent	Nov-Jun	>60	---	High-----	Moderate.
69A:											
Karlin----------	A	None--------	---	---	2.0-4.0	Apparent	Nov-Apr	>60	---	Low------	High.
Croswell---------	A	None--------	---	---	2.0-5.0	Apparent	Nov-May	>60	---	Low------	Moderate.
70B:											
Sundog----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Channing---------	B	None--------	---	---	0.5-1.5	Apparent	Nov-May	>60	---	Moderate	Moderate.
71D:											
Karlin----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Vilas----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Rock outcrop-----	---	None--------	---	---	>6.0	---	---	0-4	Hard	---	---
72B, 72D, 72F----- Karlin	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
73A---------- Gaastra	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	Moderate	Moderate.
74A---------- Au Gres	B	None--------	---	---	0.5-1.5	Apparent	Nov-May	>60	---	Low------	Moderate.
75---------- Kinross	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High-----	Moderate.
76---------- Ensley	B/D	None--------	---	---	+1-0.5	Apparent	Oct-Jun	>60	---	High-----	Low.
77B, 77D---------- Vilas	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
78B, 78D, 78F:											
Vilas----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Karlin----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
79A, 79B---------- Fence	B	None--------	---	---	2.0-6.0	Perched	Nov-May	>60	---	Low------	High.
79D---------- Fence	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
80B, 80D, 80F----- Fence	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
82B, 82D, 82F----- Keweenaw	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
100B, 100D:											
Keweenaw	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Karlin	A	None	---	---	>6.0	---	---	>60	---	Low	High.
101B:											
Trenary	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Solona	C	None	---	---	1.0-3.0	Apparent	Mar-Jul	>60	---	High	Low.
102B--Escanaba	A	None	---	---	>6.0	---	---	>60	---	Low	Low.
103B, 103D:											
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
Sarona	B	None	---	---	>6.0	---	---	>60	---	Low	High.
104A--Stambaugh	B	None	---	---	2.5-5.0	Apparent	Nov-Apr	>60	---	Low	Moderate.
104B, 104D--Stambaugh	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
105D:											
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
Rock outcrop	---	None	---	---	>6.0	---	---	0-4	Hard	---	---
106D--Champion	B	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
107B, 107D, 107F--Sarona	B	None	---	---	>6.0	---	---	>60	---	Low	High.
108D, 108F:											
Sarona	B	None	---	---	>6.0	---	---	---	---	Low	High.
Rock outcrop	---	None	---	---	>6.0	---	---	0-4	Hard	---	---
109D--Udorthents	---	None	---	---	>6.0	---	---	>60	---	---	---
110B:											
Petticoat	B	None	---	---	1.5-4.0	Apparent	Nov-May	>60	---	Low	Moderate.
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
110D:											
Petticoat	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
111B:											
Champion	B	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
Net	C	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	Moderate	Moderate.
112B, 112D, 112F--Sundog	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
113A--Sundog	B	None	---	---	2.5-6.0	Apparent	Nov-May	>60	---	Low	Moderate.
114A:											
Minocqua	B/D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	High	High.
Channing	B	None	---	---	0.5-1.5	Apparent	Nov-May	>60	---	Moderate	Moderate.
115A--Manitowish	B	None	---	---	3.0-6.0	Apparent	Nov-May	>60	---	Low	Moderate.
116B, 116D--Wabeno	B	None	---	---	1.5-3.5	Perched	Nov-Jun	>60	---	Moderate	High.
121B--Peavy	B	None	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	Moderate	Moderate.
121D--Peavy	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
122B, 122D:											
Sarona	B	None	---	---	>6.0	---	---	>60	---	Low	High.
Karlin	A	None	---	---	>6.0	---	---	>60	---	Low	High.
123B, 123D--Ocqueoc	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
124B, 125B:											
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
Net	C	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	Moderate	Moderate.
126B, 126D--Champion	B	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
126F--Champion	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
127D--Goodman	B	None	---	---	>6.0	---	---	>60	---	Low	High.
128B, 128D:											
Goodman	B	None	---	---	>6.0	---	---	>60	---	Low	High.
Wabeno	B	None	---	---	1.5-3.5	Perched	Oct-Jun	>60	---	Moderate	High.
Sundog	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
128F:											
Goodman	B	None	---	---	>6.0	---	---	>60	---	Low	High.
Sundog	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
163B, 163D, 163F--Sagola	B	None	---	---	>6.0	---	---	>80	---	Low	Low.
164B--Alstad	C	None	---	---	1.0-3.0	Perched	Nov-May	>60	---	Moderate	Moderate.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
165B: Sundog	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Channing	B	None	---	---	0.5-1.5	Apparent	Nov-May	>60	---	Moderate	Moderate.
166F: Soperton	B	None	---	---	>6.0	---	---	>60	---	Low	High.
167A: Monico	C	None	---	---	1.0-3.0	Perched	Nov-May	>60	---	Moderate	High.
168F: Soperton	B	None	---	---	>6.0	---	---	>60	---	Low	High.
Rock outcrop	---	None	---	---	1.5-3.5	Perched	Oct-Jun	0-4	Hard	---	---
500B, 500D: Wabeno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
501F: Soperton	B	None	---	---	>6.0	---	---	>60	---	Low	High.
502B, 502D: Champion	B	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
502F: Champion	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
503A: Typic Fragiaquods	C	None	---	---	0.5-1.5	Perched	Oct-Jun	>60	---	Moderate	Moderate.
504B, 504D, 504F: Pence	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
505, 506: Humaquepts	D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---
507A: Monico	C	None	---	---	1.0-3.0	Perched	Nov-May	>60	---	Moderate	High.
508A: Beechwood	C	None	---	---	1.0-2.0	Apparent	Sep-Jul	>60	---	Moderate	Moderate.
509A: Typic Dystrochrepts	B	None	---	---	4.0-6.0	Apparent	Nov-May	>60	---	Moderate	Moderate.
510: Borosaprists	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	Moderate.
511B, 511D, 511F: Typic Dystrochrepts	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
512: Borosaprists	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	High.
513B: Entic Haplorthods	A	None	---	---	4.0-6.0	Apparent	Nov-May	>60	---	Moderate	Moderate.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
514B---------- Stambaugh	B	None--------	---	---	2.5-5.0	Apparent	Nov-Apr	>60	---	Low------	Moderate.
515---------- Borosaprists	A/D	Frequent----	Brief-----	Oct-May	0-1.0	Apparent	Sep-Jun	>60	---	Moderate	Moderate.
516B, 516D-------- Fragiorthods	---	None--------	---	---	1.0-2.0	Perched	Oct-May	>60	---	---	---
517B, 517D, 517F-- Lode	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
518---------- Humaquepts	D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---
519A---------- Monico	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	Moderate	High.
520B---------- Haplorthods	---	None--------	---	---	4.0-6.0	Apparent	Nov-May	>60	---	---	---
521B---------- Pence	B	None--------	---	---	6.0-10	Apparent	Nov-Mar	>60	---	Low------	Moderate.
522D:											
Entic Fragiorthods----	B	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
Typic Dystrochrepts---	B	None--------	---	---	>6.0	---	---	40-80	---	---	---
523B:											
Entic Haplorthods	---	None--------	---	---	6.0-10	Apparent	Nov-Mar	>60	---	---	---
Typic Haplaquepts	---	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---
524D, 524F-------- Haplorthods	B	None--------	---	---	>6.0	---	---	40-60	Hard	---	---
525B, 525D, 525F-- Entic Haplorthods	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
527:											
Borohemists------	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	High.
Borosaprists-----	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	High.
528---------- Borohemists	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	High.
529---------- Borohemists	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	Moderate.
530:											
Borosaprists-----	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	Moderate.
Histic Humaquepts	D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
531C---------- Champion	B	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
532F:											
Champion---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
Haplorthods------	B	None--------	---	---	>6.0	---	---	20-60	Hard	---	---
533B---------- Entic Fragiorthods	B	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
534B, 534D-------- Entic Haplorthods	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
535B, 535D-------- Vilas	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
536F---------- Entic Haplorthods	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
537B---------- Haplorthods	A	None--------	---	---	2.0-3.0	Apparent	Nov-May	>60	---	---	---
538B, 538D-------- Entic Haplorthods	---	None--------	---	---	>6.0	---	---	>60	---	---	---
539B---------- Karlin	A	None--------	---	---	6.0-10	Apparent	Nov-May	>60	---	Low------	Moderate.
540B:											
Entic Fragiorthods----	B	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	---	---
Typic Fragiaquods	C	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---	---	---
Borosaprists-----	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	Moderate	Moderate.
541---------- Fluvaquents	D	Frequent----	Brief-----	Nov-May	0-1.0	Apparent	Nov-May	>60	---	---	---
542B, 542D-------- Gogebic	B	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High.
542F---------- Gogebic	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
543A---------- Haplaquods	---	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	---	---
544C, 544D, 544F, 545B, 545D, 545F, 546C, 546D, 546F- Haplorthods	---	None--------	---	---	>6.0	---	---	>60	---	---	---
547B---------- Haplorthods	B	None--------	---	---	6.0-10	Apparent	Nov-Mar	>60	---	---	---
548:											
Humaquepts-------	D	Frequent----	Brief-----	Nov-May	0-1.0	Apparent	Nov-May	>60	---	---	---

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
548: Terric Borosaprists	D	Frequent	Brief	Nov-May	0-1.0	Apparent	Nov-May	>60	---	Moderate	Moderate.
549B, 549D, 549F: Karlin	A	None	---	---	>6.0	---	---	>60	---	Low	High.
Pence	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
550 Terric Borosaprists	D	Frequent	Brief	Nov-May	0-1.0	Apparent	Nov-May	>60	---	Moderate	Moderate.
551A Typic Fragiorthods	---	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	---	---
552F, 553D Kalkaska	A	None	---	---	>6.0	---	---	>60	---	Low	High.
554B Alfic Fragiorthods	C	None	---	---	1.0-2.0	Perched	Oct-May	>60	---	Moderate	Moderate.
555B Entic Haplorthods	---	None	---	---	6.0-10	Apparent	Nov-Mar	>60	---	---	---
556 Haplaquods	---	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	---	---

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alfic Fragiorthods, coarse-loamy	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Alstad	Fine-loamy, mixed Glossaquic Eutroboralfs
Aquents	Aquents
Au Gres	Sandy, mixed, frigid Entic Haplaquods
Beechwood	Coarse-loamy, mixed, frigid Aquic Dystrochrepts
Borohemists	Borohemists
Borosaprists	Borosaprists
Cathro	Loamy, mixed, euic Terric Borosaprists
Champion	Coarse-loamy, mixed, frigid Typic Fragiorthods
Channing	Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Entic Haplaquods
Croswell	Sandy, mixed, frigid Entic Haplorthods
Ensley	Coarse-loamy, mixed, nonacid, frigid Aeric Haplaquepts
Entic Fragiorthods, coarse-loamy	Coarse-loamy, mixed, frigid Entic Fragiorthods
Entic Haplorthods	Entic Haplorthods
Entic Haplorthods, coarse-loamy	Coarse-loamy, mixed, frigid Entic Haplorthods
Entic Haplorthods, sandy	Sandy, mixed, frigid Entic Haplorthods
Entic Haplorthods, sandy-skeletal	Sandy-skeletal, mixed, frigid Entic Haplorthods
Escanaba	Loamy, mixed Arenic Eutroboralfs
Fence	Coarse-silty, mixed, frigid Alfic Haplorthods
Fluvaquents	Fluvaquents
Fragiorthods	Fragiorthods
Gaastra	Coarse-loamy, mixed, frigid Alfic Haplaquods
Gogebic	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Goodman	Coarse-loamy, mixed, frigid Alfic Haplorthods
Greenwood	Dysic Typic Borohemists
Haplaquods	Haplaquods
Haplorthods	Haplorthods
Histic Humaquepts	Histic Humaquepts
Histosols	Histosols
Humaquepts	Humaquepts
Kalkaska	Sandy, mixed, frigid Typic Haplorthods
Karlin	Sandy, mixed, frigid Entic Haplorthods
Keweenaw	Sandy, mixed, frigid Alfic Haplorthods
Kinross	Sandy, mixed, frigid Typic Haplaquods
Lode	Coarse-loamy, mixed, frigid Entic Haplorthods
Lupton	Euic Typic Borosaprists
Manitowish	Sandy, mixed, frigid Entic Haplorthods
Merwin	Loamy, mixed, dysic Terric Borohemists
Minocqua	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, frigid Typic Haplaquepts
Monico	Coarse-loamy, mixed, frigid Entic Haplaquods
Net	Coarse-loamy, mixed, frigid Typic Fragiaquods
Oconto	Coarse-loamy, mixed Typic Eutroboralfs
Ocqueoc	Sandy over loamy, mixed, frigid Entic Haplorthods
Padus	Coarse-loamy, mixed, frigid Alfic Haplorthods
Peavy	Coarse-loamy, mixed, frigid Alfic Haplorthods
Pence	Sandy, mixed, frigid Entic Haplorthods
Petticoat	Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Sagola	Coarse-loamy, mixed, frigid Alfic Haplorthods
Sarona	Coarse-loamy, mixed, frigid Alfic Haplorthods
Solona	Coarse-loamy, mixed Aquic Eutroboralfs
Soperton	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Stambaugh	Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Sundog	Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Entic Haplorthods
Terric Borosaprists	Terric Borosaprists
Trenary	Coarse-loamy, mixed, frigid Alfic Haplorthods
Typic Dystrochrepts	Typic Dystrochrepts
Typic Dystrochrepts, coarse-loamy	Coarse-loamy, mixed, frigid Typic Dystrochrepts

TABLE 20.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Typic Fragiaquods	Typic Fragiaquods
Typic Fragiaquods, coarse-loamy	Coarse-loamy, mixed, frigid Typic Fragiaquods
Typic Fragiorthods	Typic Fragiorthods
Typic Haplaquepts	Typic Haplaquepts
Udorthents	Udorthents
Vilas	Sandy, mixed, frigid Entic Haplorthods
Wabeno	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Waucedah	Coarse-loamy, mixed, nonacid, frigid Histic Humaquepts
Witbeck	Coarse-loamy, mixed, nonacid, frigid Histic Humaquepts

Interpretive Groups

INTERPRETIVE GROUPS

(Dashes indicate that the soil is not placed in the interpretive group)

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
50. Aquents and Histosols						
51---------- Lupton---------- Cathro---------- Humaquepts----------	VIw	---	TTS	---	 2W 5W ---	 Mc M/3c ---
52---------- Greenwood---------- Merwin----------	VIIw	---	PCS	---	 2W 2W	 Mc-a Mc-a
53---------- Waucedah---------- Cathro----------	Vw	---	FMC	---	 3W 5W	 L-4c M/3c
54. Pits						
55A---------- Oconto	IIs	Yes	TM	ATD	3L	4a
55B---------- Oconto	IIe	Yes	TM	ATD	3L	4a
55D---------- Oconto	IVe	---	TM	ATD	3L	4a
56. Pits and dumps						
57A---------- Padus	IIs	Yes	TM	ATD	3L	3a-a
57B---------- Padus	IIe	Yes	TM	ATD	3L	3a-a
57D---------- Padus	VIe	---	TM	ATD	3L	3a-a
57F---------- Padus	VIIe	---	TM	ATD	3R	3a-a
58B---------- Trenary	IIIs	---	AVO	---	3L	3a
58D---------- Trenary	VIe	---	AVO	---	3L	3a
59A---------- Solona	IIIs	---	AVO-CI	TMC	3W	3b
60D---------- Trenary---------- Rock outcrop.	VIe	---	TM	ATD	 3L	 3a
64A---------- Channing	IIIw	---	TMC-Vac	TMC	2W	3/5b

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
65---------- Witbeck	Vw	---	FI	---	5W	3c
67B---------- Net	VIIs	---	TMC	---	3W	3b-af
68B----------	VIIs	---	TMC	FI		
Net----------					3W	3b-af
Witbeck----------					5W	3c
69A----------	IIIs	---	TMV	TMC		
Karlin----------					5A	4a
Croswell----------					5S	5a
70B----------	IIIs	---	TMV	TMC-Vac		
Sundog----------					2L	3/5a
Channing----------					2W	3/5b
71D----------	VIe	---	TM	TMV		
Karlin----------					3A	4a
Vilas----------					6A	5.3a
Rock outcrop.						
72B---------- Karlin	IIIs	---	TMV	AQV	3A	4a
72D---------- Karlin	IVe	---	TMV	AQV	3A	4a
72F---------- Karlin	VIIe	---	TMV	AQV	3R	4a
73A---------- Gaastra	IIIs	---	AVO-CI	TMC	3W	2.5b
74A---------- Au Gres	IVw	---	TMC-Vac	TMC	6W	5b
75---------- Kinross	VIw	---	FMC	---	2W	5c-a
76---------- Ensley	Vw	---	FI	TTS	2W	3c
77B---------- Vilas	IVs	---	AQV	---	6A	5.3a
77D---------- Vilas	VIIs		AQV	---	6A	5.3a
78B----------	IVs	---	AQV	TMV		
Vilas----------					6A	5.3a
Karlin----------					3A	4a
78D----------	VIIs	---	AQV	TMV		
Vilas----------					6A	5.3a
Karlin----------					3A	4a
78F----------	VIIs	---	AQV	TMV		
Vilas----------					6R	5.3a
Karlin----------					3R	4a

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
79A---------- Fence	I	Yes	AVO	AOC	3L	3a
79B---------- Fence	IIe	Yes	AVO	AOC	3L	3a
79D---------- Fence	IIIe	---	AVO	AOC	3L	3a
80B---------- Pence	IIIe	---	TMV	AQV	3A	4a-a
80D---------- Pence	VIe	---	TMV	AQV	3A	4a-a
80F---------- Pence	VIIe	---	TMV	AQV	3R	4a-a
82B---------- Keweenaw	IIIe	---	TM	---	3A	4a-a
82D---------- Keweenaw	IVe	---	TM	---	3A	4a-a
82F---------- Keweenaw	VIIe	---	TM	---	3R	4a-a
100B---------- Keweenaw---------- Karlin----------	IIIe	---	TM	TMV	 3A 3A	 4a-a 4a
100D---------- Keweenaw---------- Karlin----------	IVe	---	TM	TMV	 3A 3A	 4a-a 4a
101B---------- Trenary---------- Solona----------	IIIs	Yes	ATD	TMC	 3L 3W	 3a 3b
102B---------- Escanaba	IIIs	Yes	TM	---	3S	4/2a
103B---------- Wabeno---------- Sarona----------	IIIs	---	AVO	ATD	 3L 3L	 2a-af 3a
103D---------- Wabeno---------- Sarona----------	VIe	---	AVO	ATD	 3L 3L	 2a-af 3a
104A---------- Stambaugh	IIIs	---	AVO	---	3L	3/5a-a
104B---------- Stambaugh	IIIs	---	AVO	---	3L	3/5a-a
104D---------- Stambaugh	VIe	---	AVO	---	3L	3/5a-a
105D---------- Wabeno---------- Rock outcrop.	VIIe	---	TM	ATD	 3L	 2a-af

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
106D---------- Champion	VIIe	---	ATD	---	3W	3a-af
107B---------- Sarona	IIIs	---	ATD	TM	3L	3a
107D---------- Sarona	VIe	---	ATD	TM	3L	3a
107F---------- Sarona	VIIe	---	ATD	TM	3R	3a
108D---------- Sarona---------- Rock outcrop.	VIIe	---	TM	TMV	3L	3a
108F---------- Sarona---------- Rock outcrop.	VIIIs	---	TM	TMV	3R	3a
109D. Udorthents						
110B---------- Petticoat---------- Wabeno----------	VIs	---	AVO	ATD	3L 3L	3/5a 2a-af
110D---------- Petticoat---------- Wabeno----------	VIIe	---	AVO	ATD	3L 3L	3/5a 2a-af
111B---------- Champion---------- Net----------	IVs	---	ATD	TMC	3W 3W	3a-af 3b-af
112B---------- Sundog	IIe	Yes	TMV	TM	2L	3/5a
112D---------- Sundog	IVe	---	TMV	TM	2L	3/5a
112F---------- Sundog	VIIs	---	TMV	TM	2R	3/5a
113A---------- Sundog	IIIs	Yes	TMC-Vac	TMV	4L	3/5a
114A---------- Minocqua---------- Channing----------	VIw	---	TTS	PCS	7W 2W	4c 3/5b
115A---------- Manitowish	IIIs	---	TMV	TM	3S	4a
116B---------- Wabeno	IVs	---	AVO	AOC	3L	2a-af
116D---------- Wabeno	VIIe	---	AVO	AOC	3L	2a-af
121B---------- Peavy	IIIs	---	AVO	ATD	3W	3/2a-d

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
121D---------- Peavy	VIe	---	AVO	ATD	3D	3/2a-d
122B----------	IIIs	---	TM	TMV		
Sarona----------					3L	3a
Karlin----------					3A	4a
122D----------	VIe	---	TM	TMV		
Sarona----------					3L	3a
Karlin----------					3A	4a
123B---------- Ocqueoc	IIIs	---	TM	TMV	3A	4/2a
123D---------- Ocqueoc	IVe	---	TM	TMV	3A	4/2a
124B----------	IVs	---	ATD	TMC		
Wabeno----------					3L	2a-af
Net----------					3W	3b-af
125B----------	IVs	---	ATD	TMC		
Wabeno----------					3L	2a-af
Net----------					3W	3b-af
126B---------- Champion	IVs	---	ATD	---	3W	3a-af
126D---------- Champion	VIIe	---	ATD	---	3W	3a-af
126F---------- Champion	VIIe	---	ATD	---	3R	3a-af
127D---------- Goodman	VIIe	---	ATD	AVO	3L	2.5a
128B----------	IIIs	---	AVO	ATD		
Goodman----------					3L	2.5a
Wabeno----------					3L	2a-af
Sundog----------					2L	3/5a
128D----------	VIe	---	AVO	ATD		
Goodman----------					3L	2.5a
Wabeno----------					3L	2a-af
Sundog----------					2L	3/5a
128F----------	VIIe	---	ATD	AVO		
Goodman----------					3R	2.5a
Sundog----------					2R	3/5a
163B---------- Sagola	IIIs	---	TMV	ATD	4L	3a
163D---------- Sagola	IVe	---	TMV	ATD	4L	3a
163F---------- Sagola	VIIe	---	TMV	ATD	4R	3a
164B---------- Alstad	IIe	Yes*	TMC	---	3W	1.5b

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
165B Sundog Channing	IIe	Yes*	TMV	TMC	 2L 2W	 3/5a 3/5b
166F Soperton	VIIe	---	AVO	AOC	3R	2a-af
167A Monico	IIw	Yes*	ATD-CI	---	3W	3b-a
168F Soperton Rock outcrop.	VIIe	---	AVO	AOC	3R	2a-af
500B Wabeno	IVs	---	AVO	---	3L	2a-af
500D Wabeno	VIIe	---	AVO	---	3L	2a-af
501F Soperton	VIIe	---	AVO	---	3R	2a-af
502B Champion	IVs	---	ATD	---	3W	2a-af
502D Champion	VIIe	---	ATD	---	3W	2a-af
502F Champion	VIIe	---	ATD	---	3R	2a-af
503A Typic Fragiaquods	IIw	---	TMC	---	2W	---
504B Pence	IIIe	---	TMV	---	3A	4a-a
504D Pence	VIe	---	TMV	---	3A	4a-a
504F Pence	VIIe	---	TMV	---	3R	4a-a
505 Humaquepts	---	---	TTS	---	---	---
506 Humaquepts	---	---	FMC	FI	---	---
507A Monico	IIw	Yes*	ATD-CI	---	3W	3b-a
508A Beechwood	IIw	Yes*	TMC	---	2W	3b
509A Typic Dystrochrepts	IIs	---	AVO-CI	---	3L	---
510 Borosaprists	---	---	TTS	---	---	---

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
511B---------- Typic Dystrochrepts	IIe	---	TM	---	9L	---
511D---------- Typic Dystrochrepts	IVe	---	TM	---	9L	---
511F---------- Typic Dystrochrepts	VIIe	---	TM	---	9R	---
512---------- Borosaprists	---	---	PCS	---	---	---
513B---------- Entic Haplorthods	IIe	---	ATD	---	3L	---
514B---------- Stambaugh	IIIs	---	ATD	---	3L	3/5a
515---------- Borosaprists	---	---	FMC	---	---	---
516B---------- Fragiorthods	---	---	TMV	---	---	---
516D---------- Fragiorthods	---	---	TMV	---	---	---
517B---------- Lode	IIe	Yes	TM	---	7L	3/5a-a
517D---------- Lode	IVe	---	TM	---	7L	3/5a-a
517F---------- Lode	VIIe	---	TM	---	7R	3/5a-a
518---------- Humaquepts	---	---	TTS	---	---	---
519A---------- Monico	IIw	Yes*	TMC-Vac	---	5W	3b-a
520B---------- Haplorthods	---	---	TMC-Vac	---	---	---
521B---------- Pence	IIIe	---	TMV	---	9A	4a-a
522D----------	IIe	---				
Entic Fragiorthods------			ATD	---	8W	---
Typic Dystrochrepts-----			TMV	---	---	---
523B----------	---	---				
Entic Haplorthods-------			ATD	---	---	---
Typic Haplaquepts-------			TMC	---	---	---
524D---------- Haplorthods	---	---	ATD	---	---	---
524F---------- Haplorthods	---	---	ATD	---	---	---

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
525B---------- Entic Haplorthods	VIs	---	ATD	---	3F	---
525D---------- Entic Haplorthods	VIs	---	ATD	---	3R	---
525F---------- Entic Haplorthods	VIs	---	ATD	---	3R	---
527----------	---	---	PCS	---		
Borohemists----------					---	---
Borosaprists----------					---	---
528---------- Borohemists	---	---	PCS	---	---	---
529---------- Borohemists	---	---	TTS	---	---	---
530----------	---	---	TTS	---		
Borosaprists----------					---	---
Histic Humaquepts-------					---	---
531C---------- Champion	VIs	---	ATD	---	3W	3a-af
532F----------	VIIe	---	ATD	---		
Champion----------					3R	3a-af
Haplorthods----------					---	---
533B---------- Entic Fragiorthods	IIe	---	TMC-D	---	8W	---
534B---------- Entic Haplorthods	IVs	---	AQV	---	6A	---
534D---------- Entic Haplorthods	VIs	---	AQV	---	6A	---
535B---------- Vilas	IVs	---	AQV	---	6A	5.3a
535D---------- Vilas	VIIs	---	AQV	---	6A	5.3a
536F---------- Entic Haplorthods	VIs	---	ATD	---	3R	---
537B---------- Haplorthods	---	---	TMV	---	---	---
538B---------- Entic Haplorthods	---	---	TMV	---	---	---
538D---------- Entic Haplorthods	---	---	TMV	---	---	---
539B---------- Karlin	IVs	---	AQV	---	3A	4a

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
540B	---	---				
Entic Fragiorthods			TMC-D	---	---	---
Typic Fragiaquods			TMC	---	---	---
Borosaprists			TTS	---	---	---
541	---	---	FMC	---	---	---
Fluvaquents						
542B	IIe	---	ATD	---	3W	3a-af
Gogebic						
542D	IVe	---	ATD	---	3W	3a-af
Gogebic						
542F	VIIe	---	ATD	---	3R	3a-af
Gogebic						
543A	---	---	TMC	TTS	---	---
Haplaquods						
544C, 544D, 544F, 545B, 545D, 545F	---	---	ATD	---	---	---
Haplorthods						
546C, 546D, 546F	---	---	TM	---	---	---
Entic Haplorthods						
547B	---	---	TM	---	---	---
Haplorthods						
548	---	---	FMC	---		
Humaquepts					---	---
Terric Borosaprists					---	---
549B	IIIs	---	TM	---		
Karlin					3A	4a
Pence					3A	4a-a
549D	IVe	---	TM	---		
Karlin					3A	4a
Pence					3A	4a-a
549F	VIIe	---	TM	---		
Karlin					3R	4a
Pence					3R	4a-a
550	---	---	FMC	---	---	---
Terric Borosaprists						
551A	---	---	AVO	---	---	---
Typic Fragiorthods						
552F	VIIs	---	AQV	---	3R	5a
Kalkaska						
553D	VIs	---	ATD	---	3A	5a
Kalkaska						
554B	IIe	---	AVO	---	3W	---
Alfic Fragiorthods						

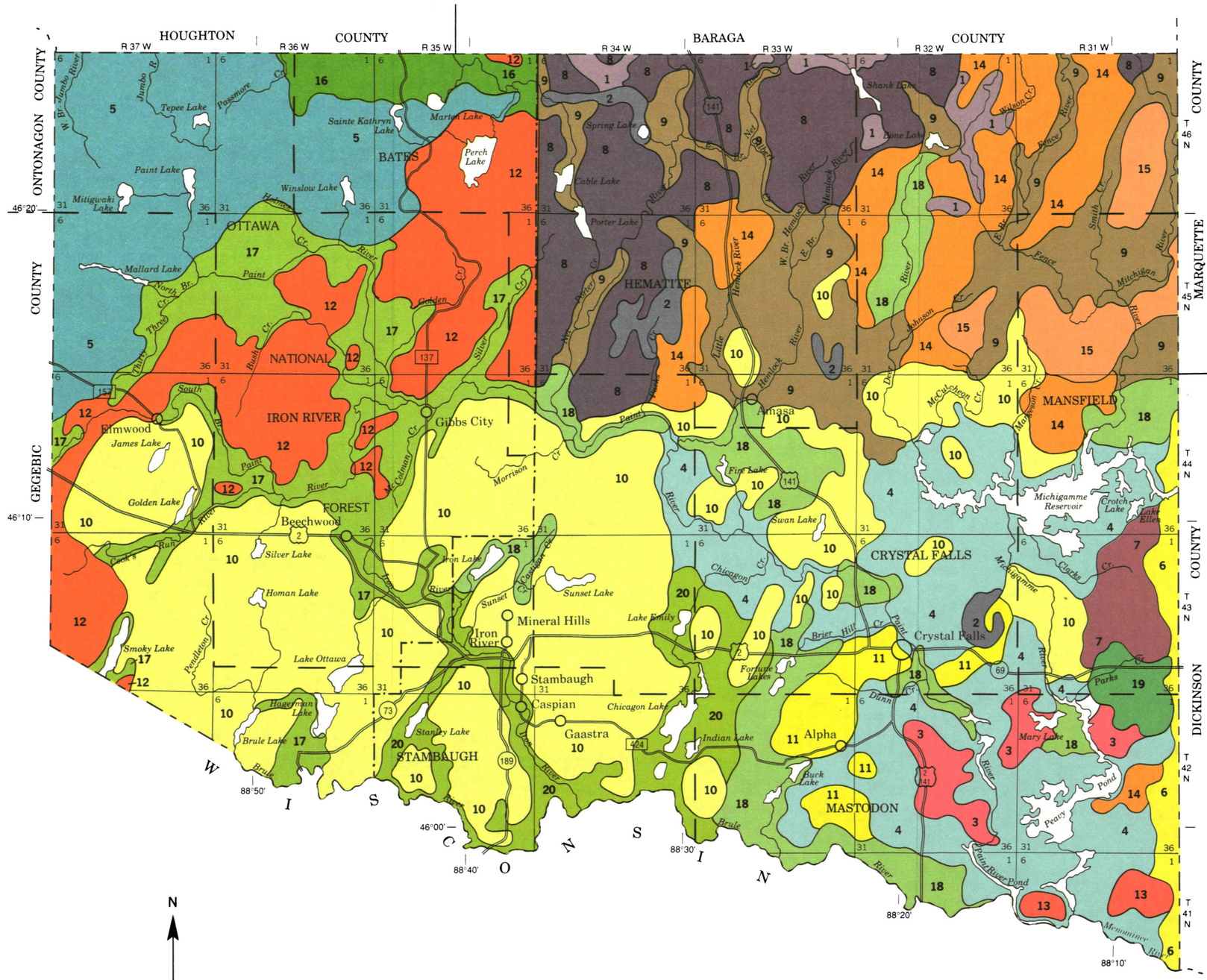
See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Prime farmland	Habitat type		Woodland ordination symbol	Michigan soil management group
			Primary	Secondary		
555B---------- Entic Haplorthods	---	---	TMV	---	---	---
556---------- Haplaquods	---	---	PCS	---	---	---

* Where drained.

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N

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SOIL LEGEND*

NEARLY LEVEL, VERY POORLY DRAINED, MUCKY OR PEATY SOILS

1 Lupton-Cathro association
2 Greenwood-Merwin association

NEARLY LEVEL TO ROLLING, EXCESSIVELY DRAINED, SANDY SOILS

3 Vilas association

NEARLY LEVEL TO HILLY, EXCESSIVELY DRAINED TO WELL DRAINED, LOAMY AND SANDY SOILS

4 Karlin-Sarona-Vilas association
5 Haplorthods association

NEARLY LEVEL TO HILLY, WELL DRAINED AND VERY POORLY DRAINED, LOAMY AND MUCKY SOILS

6 Sagola-Trenary-Cathro association

NEARLY LEVEL TO VERY STEEP, SOMEWHAT EXCESSIVELY DRAINED TO POORLY DRAINED, LOAMY SOILS

7 Trenary-Solona-Karlin association
8 Champion-Net association
9 Sundog-Minocqua-Channing association

NEARLY LEVEL TO VERY STEEP, WELL DRAINED AND MODERATELY WELL DRAINED, LOAMY SOILS ON GROUND MORAINES, END MORAINES, AND DRUMLINS

10 Wabeno association
11 Peavy association
12 Champion association
13 Sarona-Wabeno association
14 Petticoat-Wabeno association
15 Goodman-Wabeno-Sundog association

NEARLY LEVEL TO HILLY, SOMEWHAT EXCESSIVELY DRAINED TO MODERATELY WELL DRAINED, LOAMY SOILS ON OUTWASH PLAINS, STREAM TERRACES, DELTAS, AND ESKERS

16 Entic Haplorthods, sandy, stratified substratum, association
17 Pence-Lode association
18 Padus-Pence association
19 Oconto association
20 Stambaugh-Padus association

* The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1994

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
FOREST SERVICE
MICHIGAN DEPARTMENT OF AGRICULTURE
MICHIGAN AGRICULTURAL EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE
MICHIGAN TECHNOLOGICAL UNIVERSITY

GENERAL SOIL MAP

IRON COUNTY, MICHIGAN

Scale 1:253,440

1 0 1 2 3 4 Mi

1 0 4 8 Km

INDEX TO MAP SHEETS

IRON COUNTY, MICHIGAN

Scale 1:253,440

1 0 1 2 3 4 Mi

1 0 4 8 Km

N

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Inset B, sheet 8

Inset C, sheet 8

Inset D, sheet 8

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Inset A, sheet 51

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Inset D, sheet 51

Inset E, sheet 51

Inset, sheet 59

Inset, sheet 72

Inset, sheet 75

HOUGHTON COUNTY

BARAGA COUNTY

ONTONAGON COUNTY

GOGEBIC COUNTY

MARQUETTE COUNTY

DICKINSON COUNTY

KENTON

GLITTER LAKE

MARTEN LAKE

TUNIS

DRUMMOND LAKE

NED LAKE

NELSON LAKE

WITCH LAKE NE

LAKE MITIGWAKI

WINSLOW LAKE

PERCH LAKE

PORTER LAKE

TRIANGLE RANCH

NED LAKE SE

HICKMAN LAKE

WITCH LAKE

GOLDEN LAKE

BEECHWOOD

GIBBS CITY

SUNSET LAKE

AMASA

KELSO JUNCTION

KIRNAN

CHANNING

SMOKY LAKE

HAGERMAN LAKE

IRON RIVER

GAASTRA

FORTUNE LAKES

CRYSTAL FALLS

LAKE MARY

SAGOLA

TIPLER

LONG LAKE NE

NAULTS

FLORENCE WEST

FLORENCE EAST

RANDVILLE

COUNTY

TOWNSHIP

RATES

OTTAWA

HEMATITE

NATIONAL

IRON RIVER

FOREST

STAMBAUGH

MANSFIELD

CRYSTAL FALLS

MASTODON

Elmwood

Gibbs City

Beechwood

Mineral Hills

Iron River

Stambaugh

Caspian

Gaastra

Amasa

Alpha

Crystal Falls

Tepee Lake

Sainte Kathryn Lake

Marten Lake

Spring Lake

Shanks Lake

Bone Lake

Paint Lake

Mitigwaki Lake

Winslow Lake

Perch Lake

Cable Lake

Porter Lake

Mallard Lake

Golden Lake

Silver Lake

Iron Lake

Homan Lake

Sunset Lake

Lake Emily

Smoky Lake

Lake Ottawa

Hagerman Lake

Stanley Lake

Chicagon Lake

Indian Lake

Fortune Lakes

Fire Lake

Swan Lake

Michigamme Reservoir

Crotch Lake

Lake Ellen

Mary Lake

Buck Lake

Peavy Pond

Michigamme River

Paint River

Brule River

Iron River

Menominee River

Jumbo R

W Br Jumbo River

Passmore Cr

Holmes Cr

Paint River

Golden River

Hemlock River

Little Hemlock River

Net Cr

Johnson Cr

Bruce Cr

Smith Cr

Mitchigan River

Parks Cr

McCutcheon Cr

Morgenson Cr

Silver Cr

Bush Cr

Thirty Three Cr

Chicagon Cr

Clarks Cr

Wilson Cr

Dann Cr

Morrison Cr

Iron Cr

Sunset Cr

Mitchigamme Cr

Pine River

Beaver Mill Pond

Fortune Lakes

Mud Lake

Golden Lake

Cook's Run

Mud Creek

Mud Lake

Mud Creek

Iron River

Pine River Pond

Mud Lake

Mud Creek

Iron River

Mud Creek

Iron River

Mud Creek

Iron River

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE AND FOREST SERVICE

IRON COUNTY, MICHIGAN

MICHIGAN DEPARTMENT OF AGRICULTURE
MICHIGAN AGRICULTURAL EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE
MICHIGAN TECHNOLOGICAL UNIVERSITY

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
50	Aquents and Histosols, ponded
51	Lupton-Cathro-Humaquepts complex
52	Greenwood and Merwin peats
53	Waucedah-Cathro mucks, frequently flooded
54	Pits, sand and gravel
55A	Oconto very fine sandy loam, 1 to 2 percent slopes
55B	Oconto very fine sandy loam, 2 to 6 percent slopes
55D	Oconto very fine sandy loam, 6 to 18 percent slopes
56	Pits and dumps, mine
57A	Padus fine sandy loam, 1 to 2 percent slopes
57B	Padus fine sandy loam, 2 to 6 percent slopes
57D	Padus fine sandy loam, 6 to 18 percent slopes, stony
57F	Padus fine sandy loam, 18 to 35 percent slopes, stony
58B	Trenary fine sandy loam, 1 to 6 percent slopes, stony
58D	Trenary fine sandy loam, 6 to 18 percent slopes, stony
59A	Solona very fine sandy loam, 0 to 3 percent slopes, stony
60D	Trenary-Rock outcrop complex, 1 to 18 percent slopes, very stony
64A	Channing very fine sandy loam, 0 to 3 percent slopes
65	Witbeck muck, very stony
67B	Net very fine sandy loam, 0 to 4 percent slopes, very stony
68B	Net-Witbeck complex, 0 to 4 percent slopes, very stony
69A	Karlin, moderately wet-Croswell complex, 0 to 3 percent slopes
70B	Sundog-Channing very fine sandy loams, 0 to 6 percent slopes, rocky, stony
71D	Karlin-Vilas-Rock outcrop complex, 1 to 18 percent slopes, stony
72B	Karlin fine sandy loam, 1 to 6 percent slopes
72D	Karlin fine sandy loam, 6 to 18 percent slopes
72F	Karlin fine sandy loam, 18 to 35 percent slopes
73A	Gaastra silt loam, 0 to 3 percent slopes, stony
74A	Au Gres sand, 0 to 3 percent slopes
75	Kinross muck
76	Ensley fine sandy loam, stony
77B	Vilas loamy sand, 1 to 6 percent slopes
77D	Vilas loamy sand, 6 to 18 percent slopes
78B	Vilas-Karlin complex, 1 to 6 percent slopes
78D	Vilas-Karlin complex, 6 to 18 percent slopes
78F	Vilas-Karlin complex, 18 to 35 percent slopes
79A	Fence silt loam, 1 to 2 percent slopes
79B	Fence silt loam, 2 to 6 percent slopes
79D	Fence silt loam, 6 to 18 percent slopes
80B	Pence fine sandy loam, 1 to 6 percent slopes
80D	Pence fine sandy loam, 6 to 18 percent slopes
80F	Pence fine sandy loam, 18 to 35 percent slopes
82B	Keweenaw loamy fine sand, 1 to 6 percent slopes
82D	Keweenaw loamy fine sand, 6 to 18 percent slopes
82F	Keweenaw loamy fine sand, 18 to 35 percent slopes
100B	Keweenaw-Karlin complex, 1 to 6 percent slopes
100D	Keweenaw-Karlin complex, 6 to 18 percent slopes
101B	Trenary-Solona complex, 0 to 6 percent slopes, stony
102B	Escanaba loamy fine sand, 1 to 6 percent slopes
103B	Wabeno-Sarona complex, 1 to 6 percent slopes, stony
103D	Wabeno-Sarona complex, 6 to 18 percent slopes, stony
104A	Stambaugh silt loam, 1 to 2 percent slopes, stony
104B	Stambaugh silt loam, 2 to 6 percent slopes, stony
104D	Stambaugh silt loam, 6 to 18 percent slopes, stony
105D	Wabeno-Rock outcrop complex, 1 to 18 percent slopes, very stony
106D	Champion very fine sandy loam, 1 to 18 percent slopes, rocky, very stony
107B	Sarona fine sandy loam, 1 to 6 percent slopes, stony
107D	Sarona fine sandy loam, 6 to 18 percent slopes, stony
107F	Sarona fine sandy loam, 18 to 35 percent slopes, stony
108D	Sarona-Rock outcrop complex, 1 to 18 percent slopes, very stony
108F	Sarona-Rock outcrop complex, 18 to 35 percent slopes, very stony
109D	Udorthents, nearly level to rolling
110B	Petticoat-Wabeno silt loams, 1 to 6 percent slopes, very stony
110D	Petticoat-Wabeno silt loams, 6 to 18 percent slopes, very stony
111B	Champion-Net very fine sandy loams, 0 to 6 percent slopes, very stony
112B	Sundog very fine sandy loam, 1 to 6 percent slopes
112D	Sundog very fine sandy loam, 6 to 18 percent slopes
112F	Sundog cobbly fine sandy loam, 18 to 50 percent slopes, stony
113A	Sundog very fine sandy loam, moderately wet, 0 to 3 percent slopes
114A	Minocqua-Channing complex, 0 to 3 percent slopes
115A	Manitowish fine sandy loam, 0 to 3 percent slopes
116B	Wabeno silt loam, 1 to 6 percent slopes, very stony
116D	Wabeno silt loam, 6 to 18 percent slopes, very stony
121B	Peavy silt loam, 1 to 6 percent slopes, stony
121D	Peavy silt loam, 6 to 18 percent slopes, stony
122B	Sarona-Karlin fine sandy loams, 1 to 6 percent slopes, stony
122D	Sarona-Karlin fine sandy loams, 6 to 18 percent slopes, stony
123B	Ocqueoc loamy fine sand, 1 to 6 percent slopes
123D	Ocqueoc loamy fine sand, 6 to 18 percent slopes
124B	Wabeno-Net silt loams, 0 to 6 percent slopes, very stony
125B	Wabeno-Net silt loams, 0 to 6 percent slopes, rocky, very stony
126B	Champion very fine sandy loam, 1 to 6 percent slopes, very stony
126D	Champion very fine sandy loam, 6 to 18 percent slopes, very stony
126F	Champion very fine sandy loam, 18 to 35 percent slopes, very stony
127D	Goodman silt loam, 1 to 18 percent slopes, rocky, very stony
128B	Goodman-Wabeno-Sundog, sandy substratum, complex, 1 to 6 percent slopes, stony
128D	Goodman-Wabeno-Sundog, sandy substratum, complex, 6 to 18 percent slopes, stony
128F	Goodman-Sundog, sandy substratum, complex, 18 to 45 percent slopes, stony
163B	Sagola fine sandy loam, 1 to 6 percent slopes, stony
163D	Sagola fine sandy loam, 6 to 18 percent slopes, stony
163F	Sagola fine sandy loam, 18 to 35 percent slopes, stony
164B	Alstad loam, 0 to 6 percent slopes
165B	Sundog-Channing very fine sandy loams, 0 to 6 percent slopes
166F	Soperton silt loam, 18 to 35 percent slopes, very stony
167A	Monico loam, 0 to 3 percent slopes
168F	Soperton-Rock outcrop complex, 18 to 35 percent slopes, very stony
500B	Wabeno silt loam, nearly level and undulating, very stony
500D	Wabeno silt loam, rolling, very stony
501F	Soperton silt loam, hilly, very stony
502B	Champion very fine sandy loam, moderately wet, nearly level and undulating, very stony
502D	Champion very fine sandy loam, moderately wet, rolling, very stony
502F	Champion very fine sandy loam, hilly, very stony
503A	Typic Fragiaquods, coarse-loamy, nearly level
504B	Pence fine sandy loam, nearly level and undulating
504D	Pence fine sandy loam, rolling
504F	Pence fine sandy loam, hilly
505	Humaquepts, acid, very stony
506	Humaquepts, nonacid, very stony
507A	Monico loam, nearly level
508A	Beechwood silt loam, nearly level
509A	Typic Dystrochrepts, coarse-loamy, deep water table, nearly level
510	Borosaprists, nonacid
511B	Typic Dystrochrepts, coarse-loamy, sandy substratum, nearly level and undulating
511D	Typic Dystrochrepts, coarse-loamy, sandy substratum, rolling
511F	Typic Dystrochrepts, coarse-loamy, sandy substratum, hilly
512	Borosaprists, acid
513B	Entic Haplorthods, coarse-loamy, deep water table, nearly level and undulating
514B	Stambaugh silt loam, moderately wet, nearly level and undulating, stony
515	Borosaprists, frequently flooded
516B	Fragiorthods, nearly level and undulating
516D	Fragiorthods, rolling
517B	Lode silt loam, nearly level and undulating
517D	Lode silt loam, rolling
517F	Lode silt loam, hilly
518	Humaquepts, sandy substratum
519A	Monico loam, sandy substratum, nearly level
520B	Haplorthods, deep water table, nearly level and undulating
521B	Pence sandy loam, very deep water table, nearly level and undulating
522D	Entic Fragiorthods, coarse-loamy-Typic Dystrochrepts complex, nearly level to hilly, rocky, stony
523B	Entic Haplorthods-Typic Haplaquepts complex, nearly level and undulating
524D	Haplorthods, bedrock substratum, rolling, rocky
524F	Haplorthods, bedrock substratum, hilly to very steep, rocky
525B	Entic Haplorthods, sandy-skeletal, nearly level and undulating
525D	Entic Haplorthods, sandy-skeletal, rolling and hilly
525F	Entic Haplorthods, sandy-skeletal, steep and very steep
527	Borohemists-Borosaprists, acid, complex
528	Borohemists, acid
529	Borohemists, nonacid
530	Borosaprists-Histic Humaquepts, nonacid, complex
531C	Champion silt loam, nearly level to rolling, very stony
532F	Champion-Haplorthods complex, hilly, rocky, very stony
533B	Entic Fragiorthods, coarse-loamy, nearly level and undulating
534B	Entic Haplorthods, sandy, stratified substratum, nearly level and undulating
534D	Entic Haplorthods, sandy, stratified substratum, rolling
535B	Vilas loamy sand, nearly level and undulating
535D	Vilas loamy sand, rolling
536F	Entic Haplorthods, sandy-skeletal, esker, very steep
537B	Haplorthods, moderately deep water table, nearly level and undulating
538B	Entic Haplorthods, sandy substratum, nearly level and undulating
538D	Entic Haplorthods, sandy substratum, rolling
539B	Karlin sandy loam, very deep water table, nearly level and undulating
540B	Entic Fragiorthods-Typic Fragiaquods-Borosaprists, nonacid, complex, nearly level and undulating
541	Fluvaquents, frequently flooded
542B	Gogebic fine sandy loam, nearly level and undulating
542D	Gogebic fine sandy loam, rolling
542F	Gogebic fine sandy loam, well drained, hilly
543A	Haplaquods, nearly level
544C	Haplorthods, esker, rolling
544D	Haplorthods, esker, hilly
544F	Haplorthods, esker, steep
545B	Haplorthods, nearly level and undulating
545D	Haplorthods, rolling
545F	Haplorthods, hilly
546C	Entic Haplorthods, esker, rolling
546D	Entic Haplorthods, esker, hilly and steep
546F	Entic Haplorthods, esker, very steep
547B	Haplorthods, very deep water table, nearly level and undulating
548	Humaquepts-Terric Borosaprists, nonacid, complex, frequently flooded
549B	Karlin-Pence complex, nearly level and undulating
549D	Karlin-Pence complex, rolling
549F	Karlin-Pence complex, hilly
550	Terric Borosaprists, nonacid, frequently flooded
551A	Typic Fragiorthods, nearly level, stony
552F	Kalkaska sand, banded substratum, hilly
553D	Kalkaska loamy sand, rolling
554B	Alfic Fragiorthods, coarse-loamy, nearly level and undulating
555B	Entic Haplorthods, very deep water table, nearly level and undulating
556	Haplaquods, wet

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline
- AD HOC BOUNDARY (label) — Davis Airstrip
- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD, POOL, LINE

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 173
- Federal — 287
- State — 52
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small
(Named where applicable) — water

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

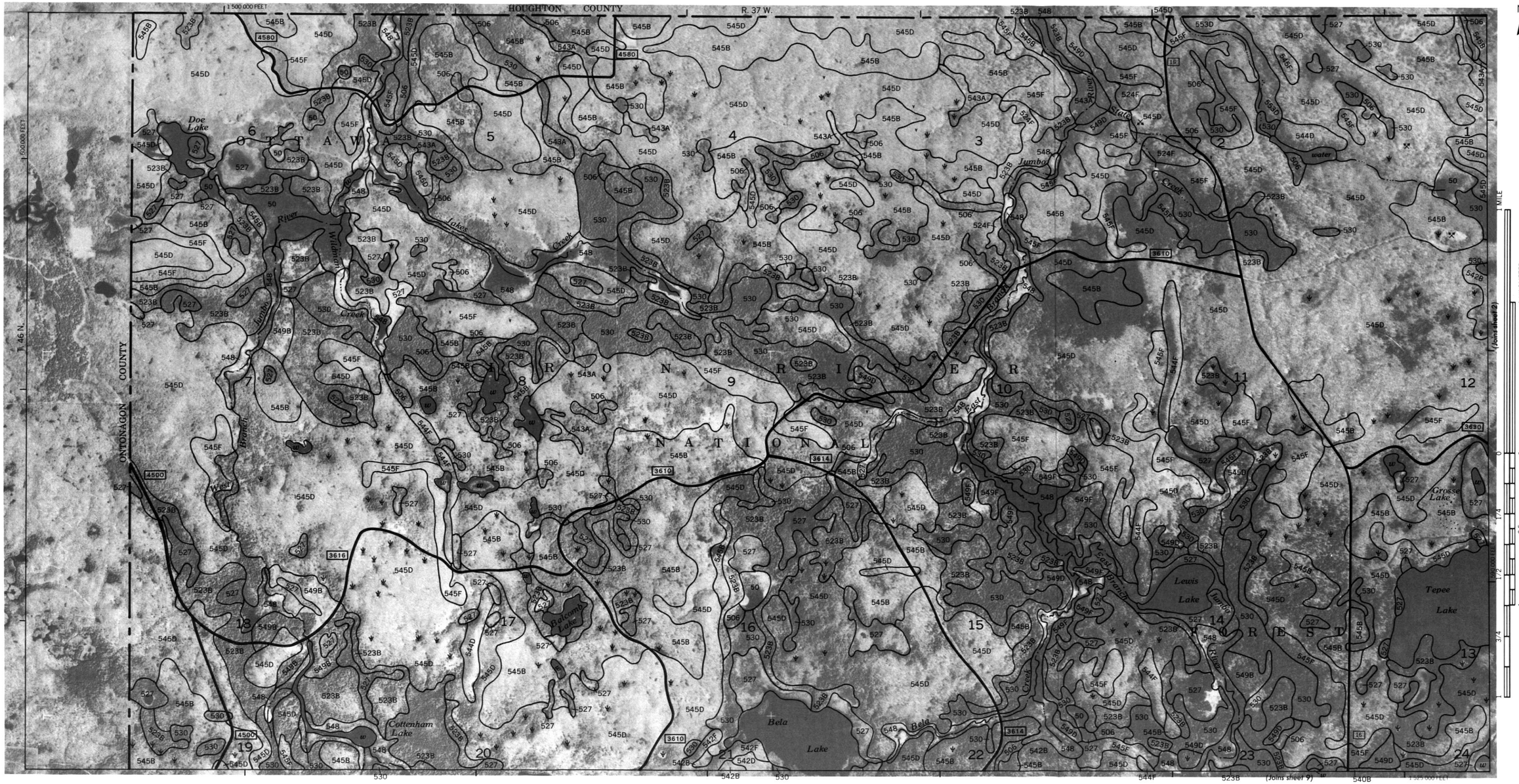
- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

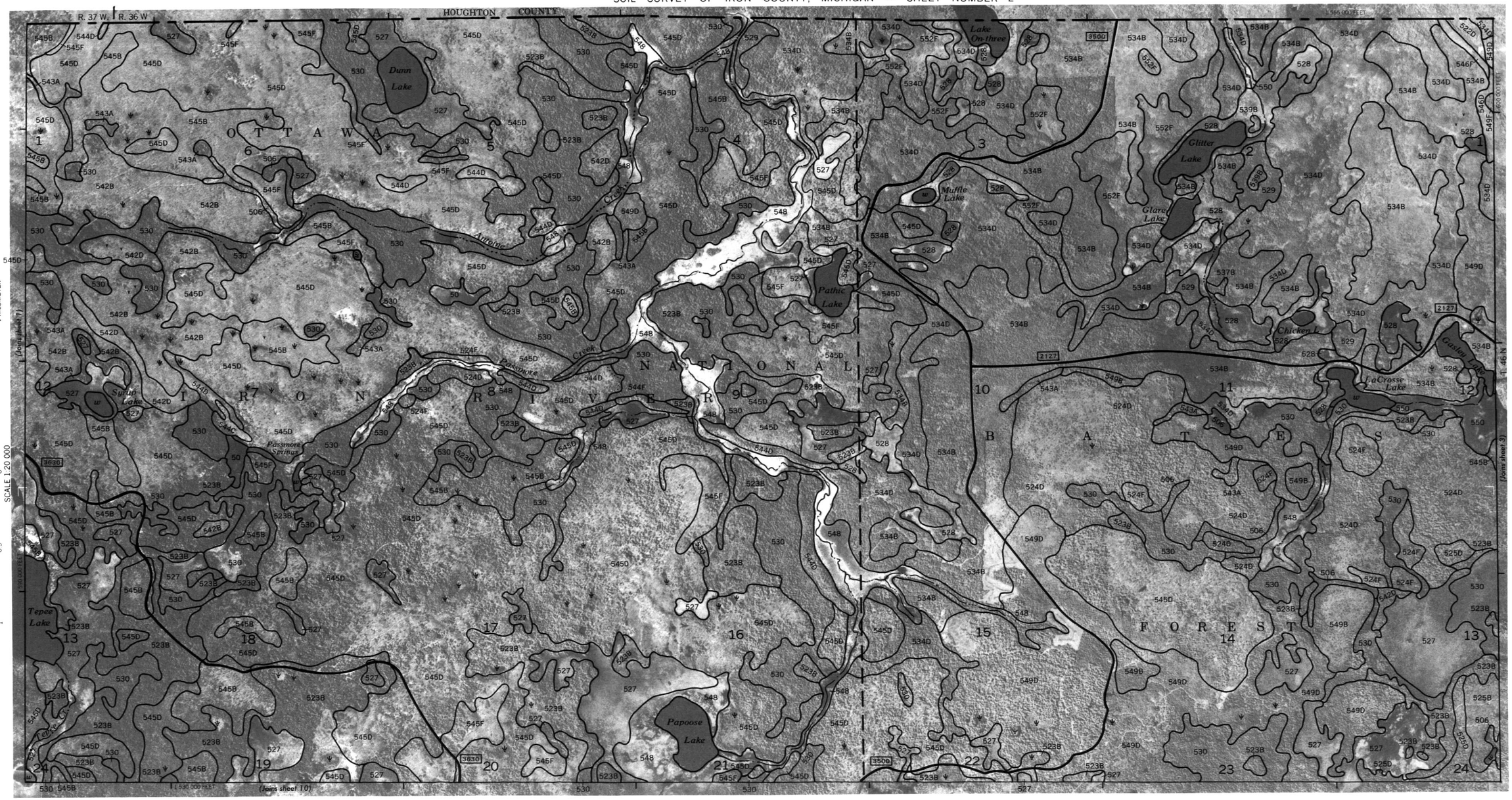
SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS — 50, 539B
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE (normally not shown) — S
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot



IRON COUNTY, MICHIGAN NO. 1

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IRON COUNTY, MICHIGAN NO. 2

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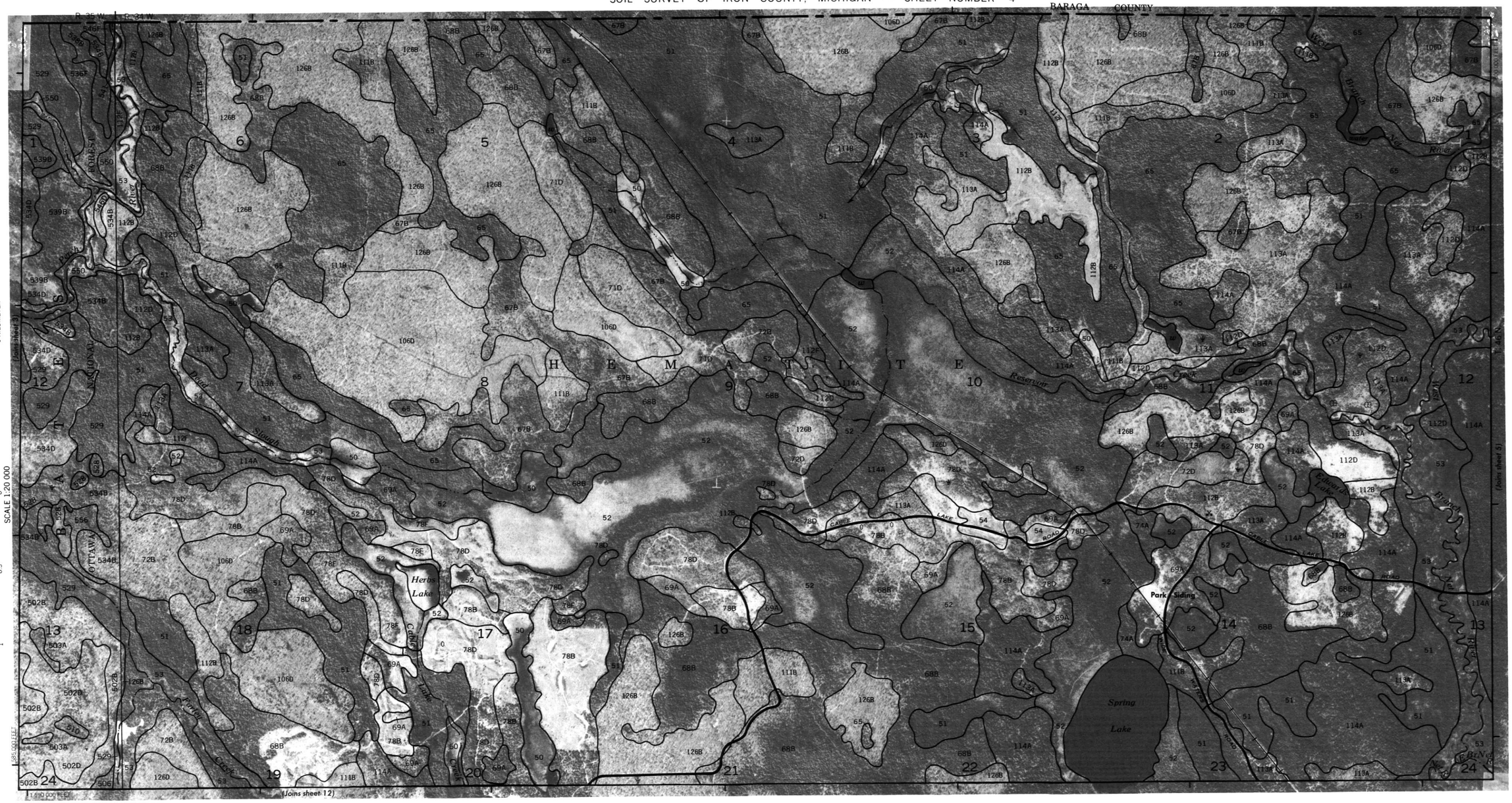


IRON COUNTY, MICHIGAN NO. 3

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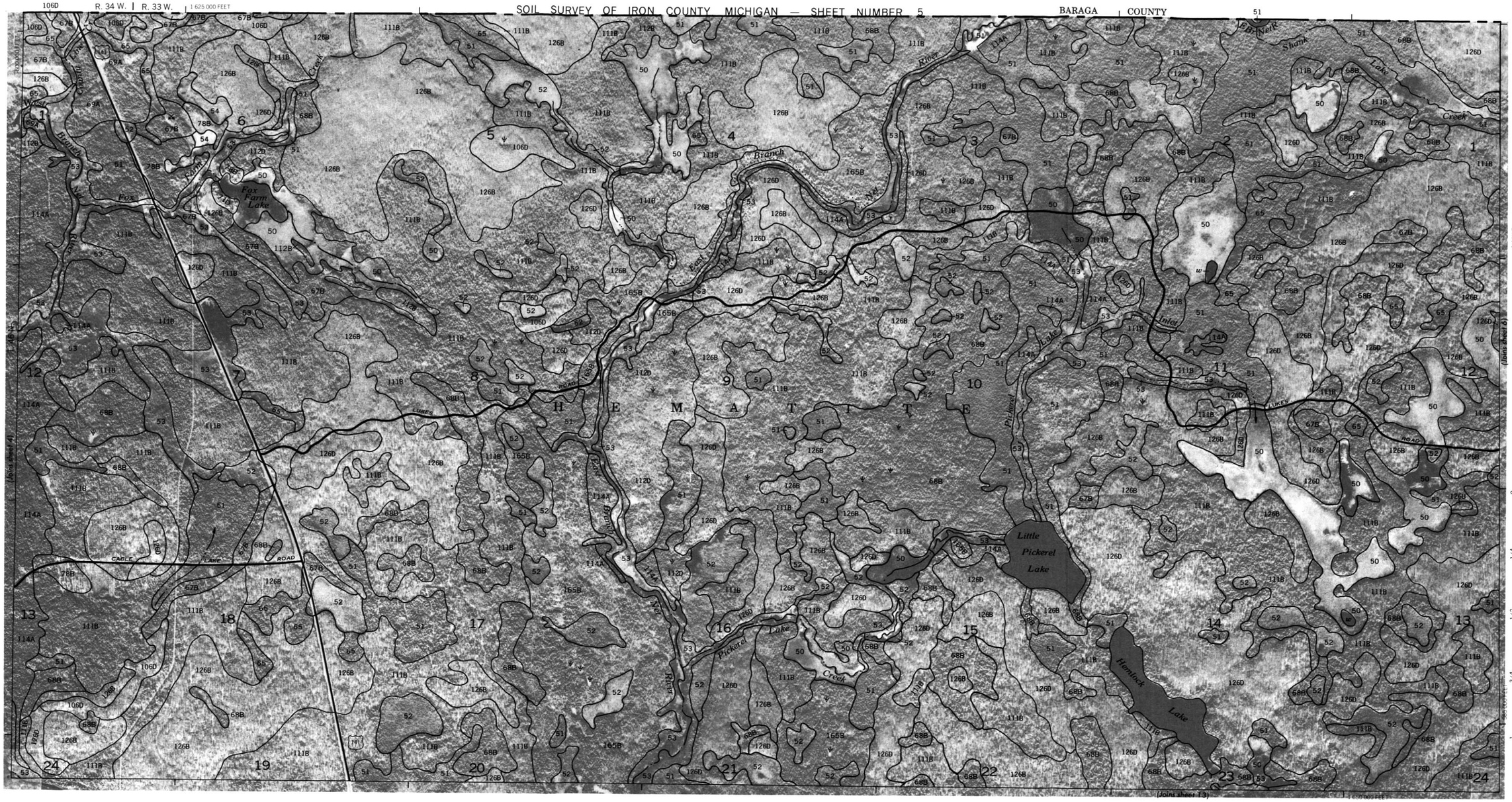
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IRON COUNTY, MICHIGAN NO. 4

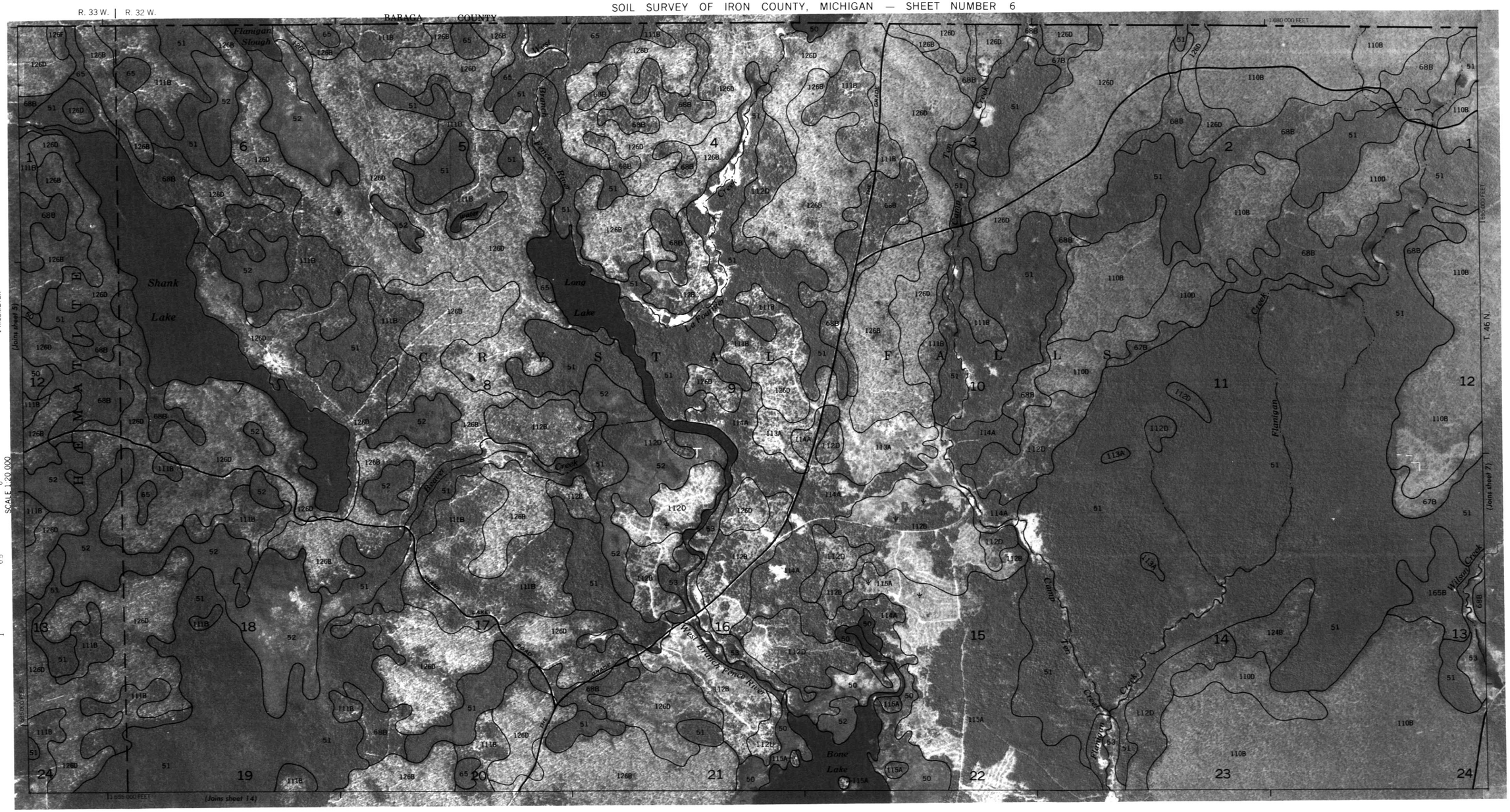
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 5

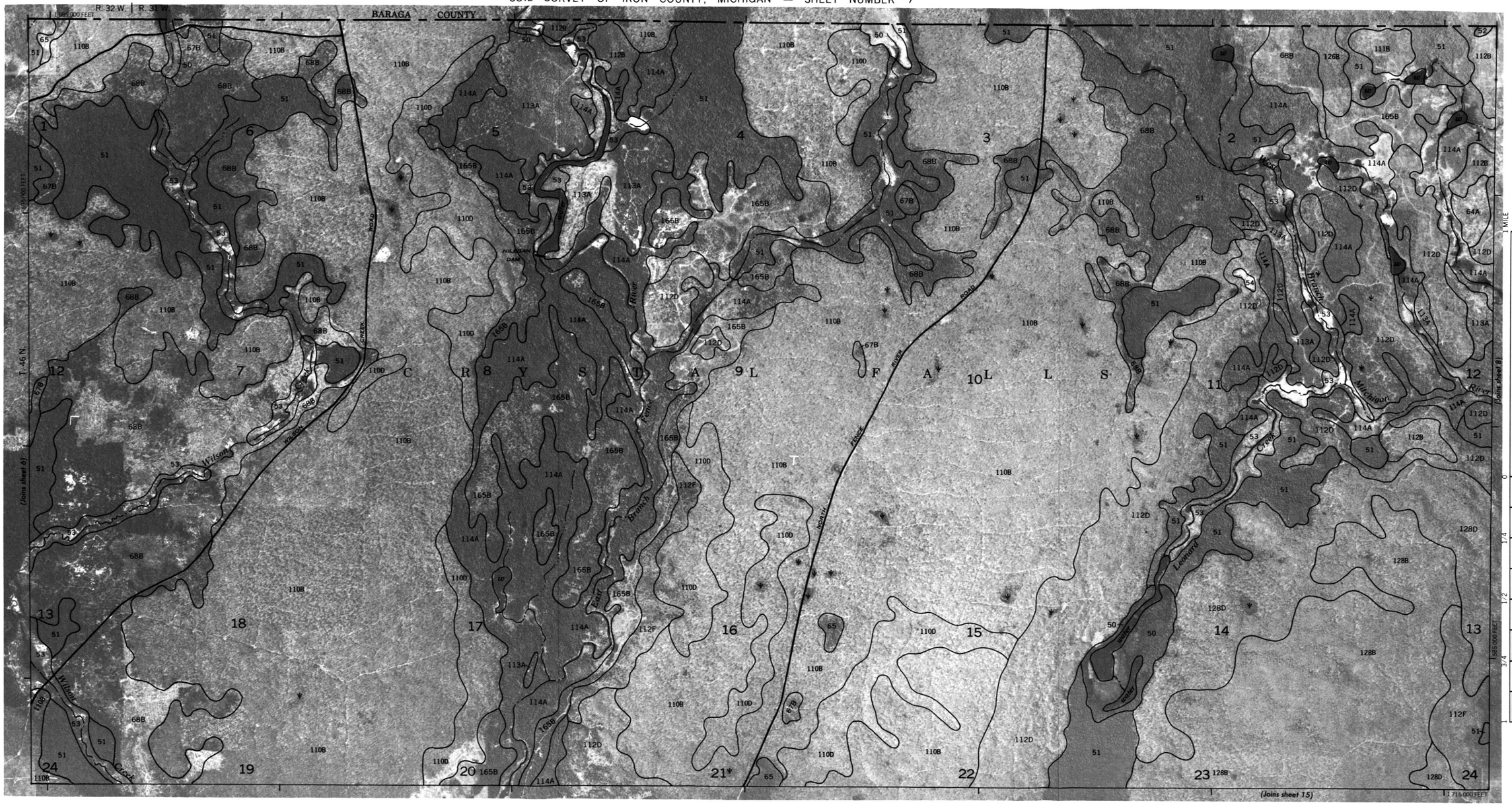
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF IRON COUNTY, MICHIGAN — SHEET NUMBER 6



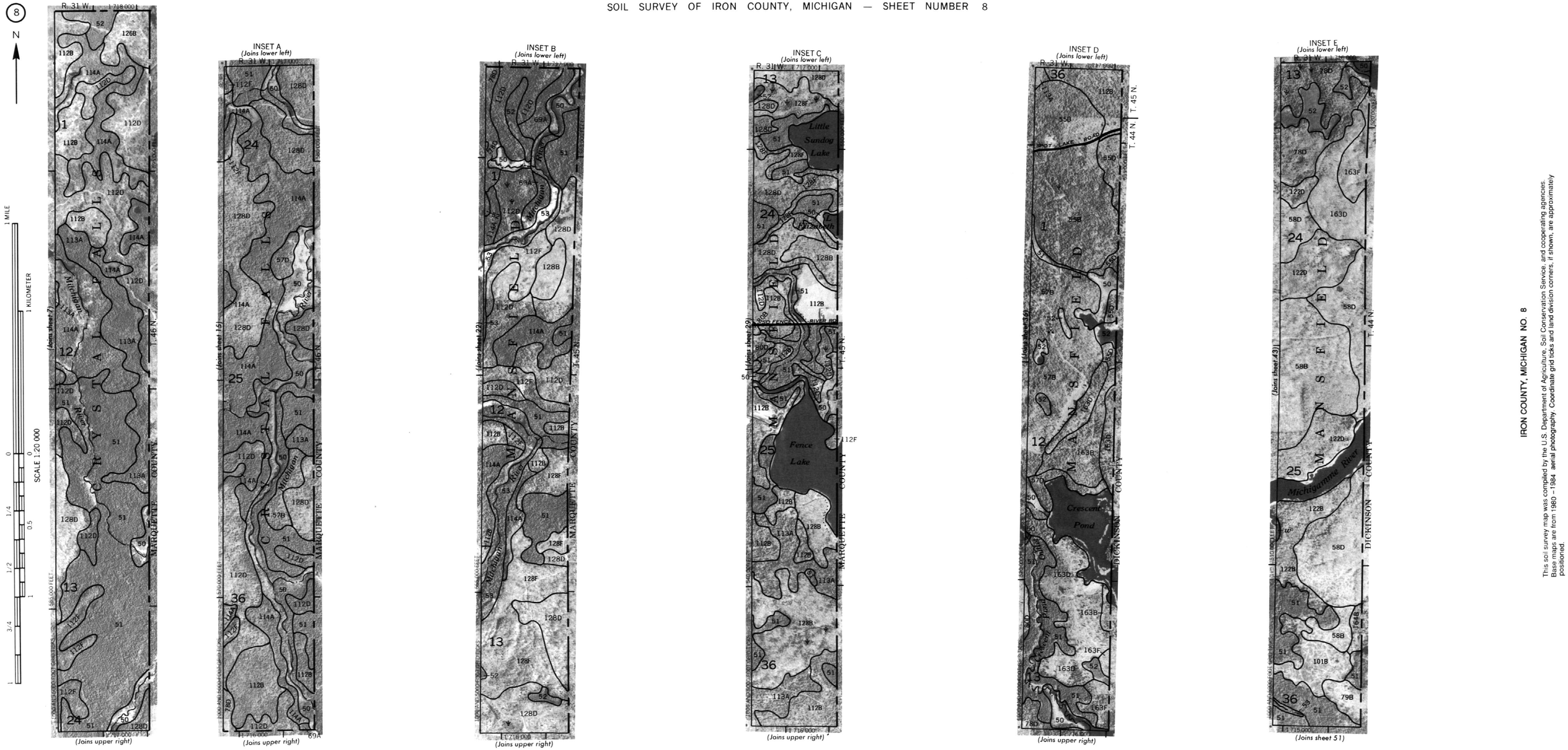
IRON COUNTY, MICHIGAN NO. 6

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



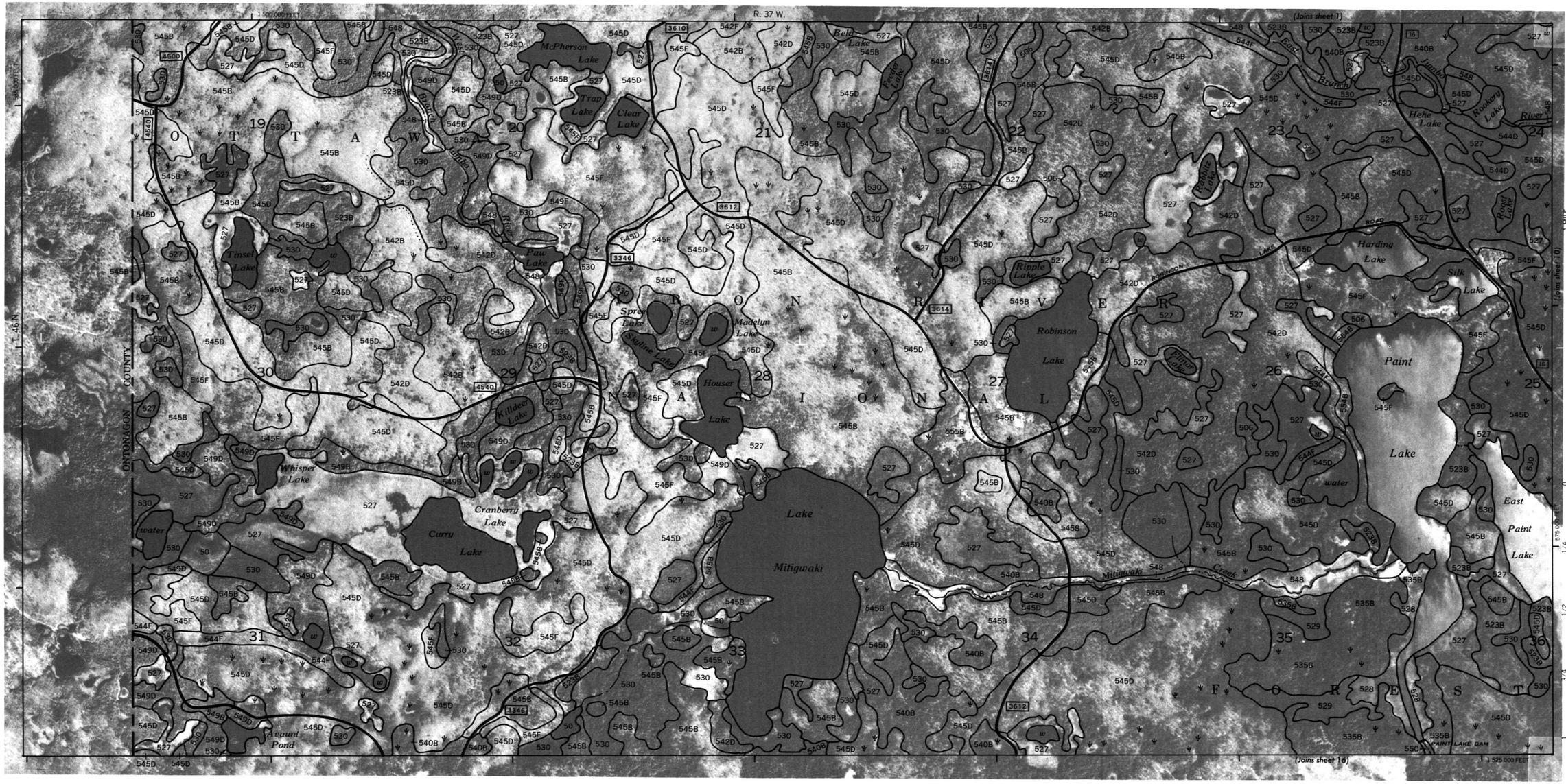
IRON COUNTY, MICHIGAN NO. 7

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



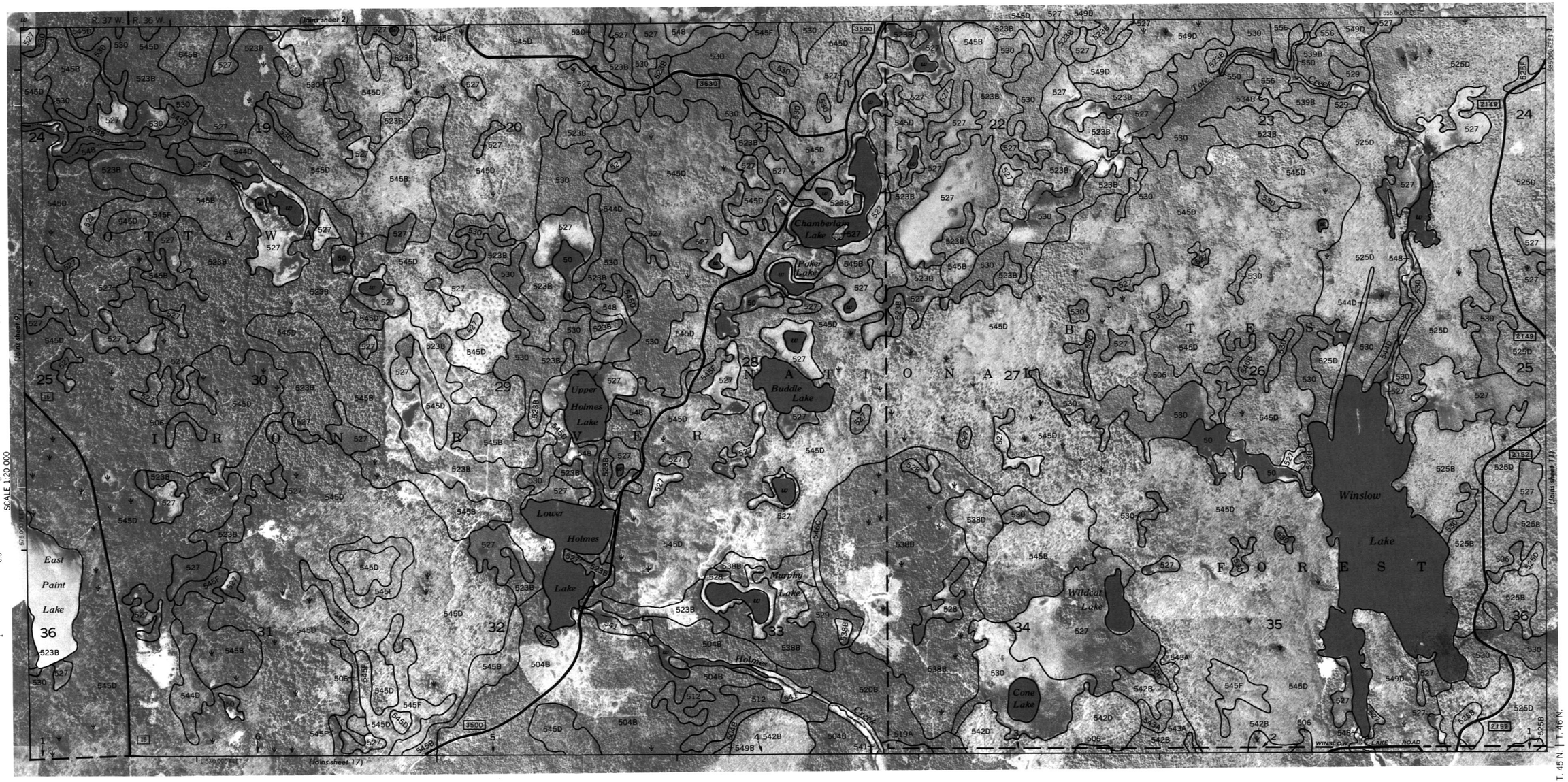
IRON COUNTY, MICHIGAN NO. 8

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



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IRON COUNTY, MICHIGAN NO. 9



IRON COUNTY, MICHIGAN NO. 10

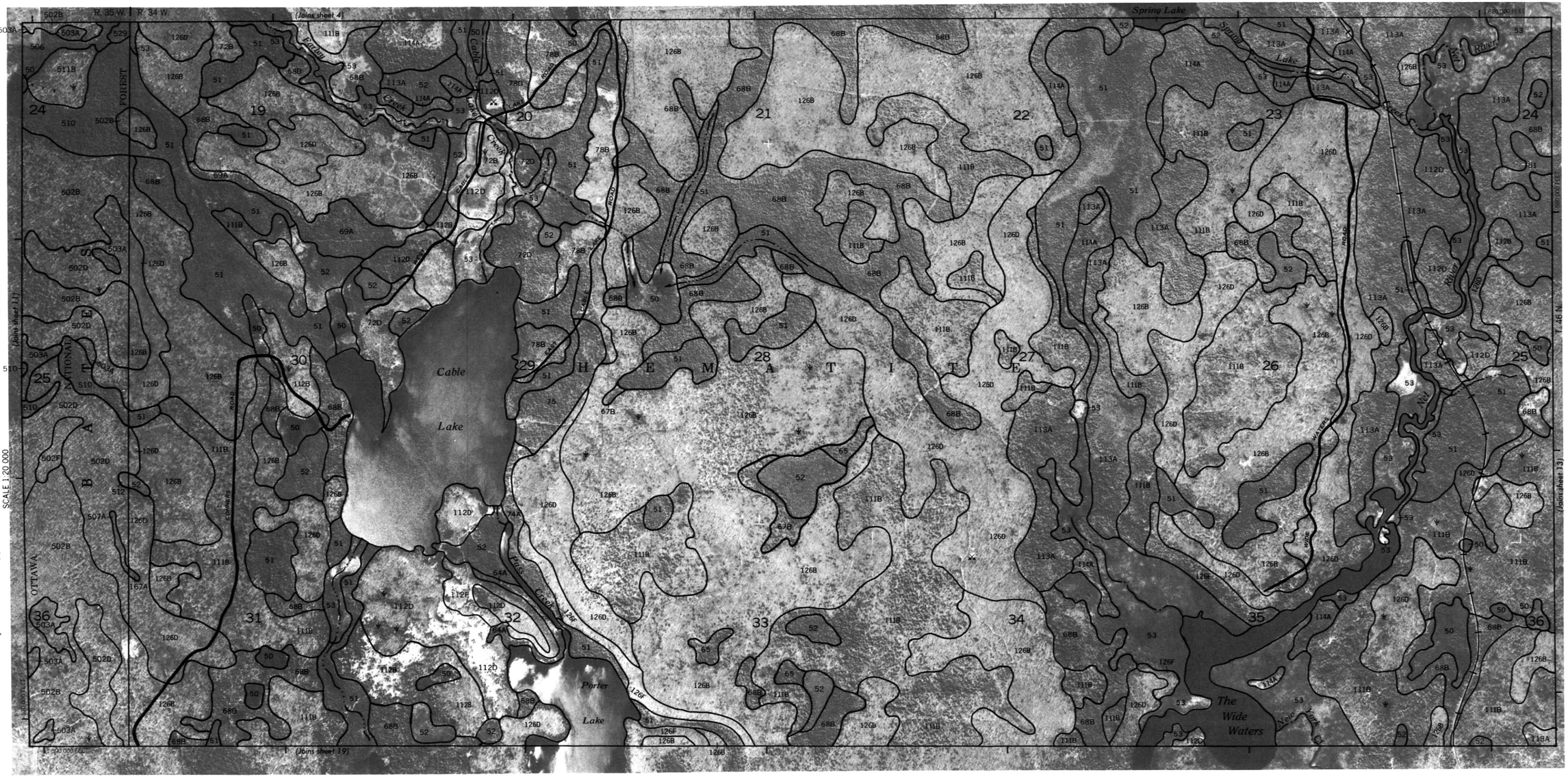
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



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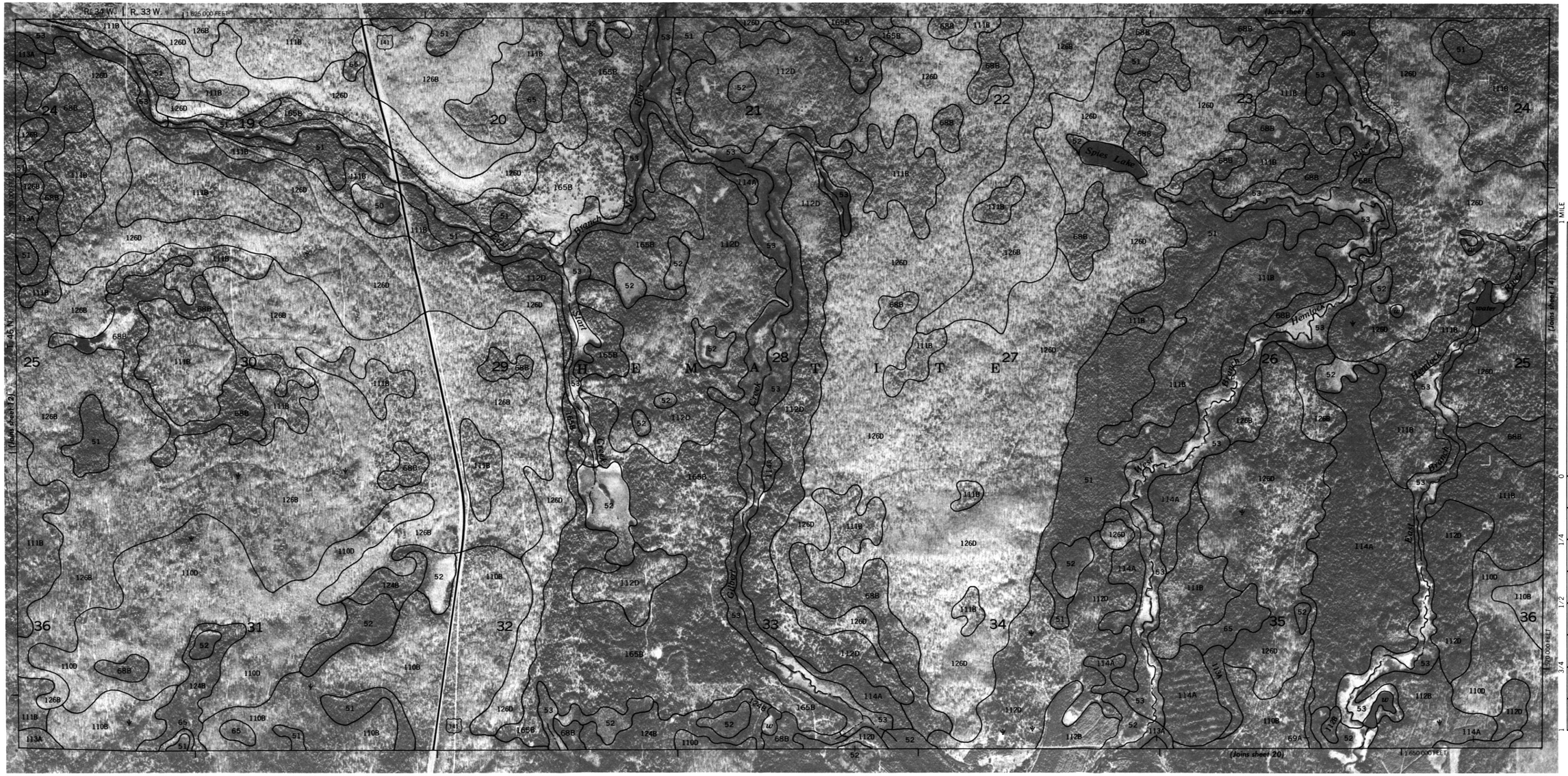
IRON COUNTY, MICHIGAN NO. 11

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



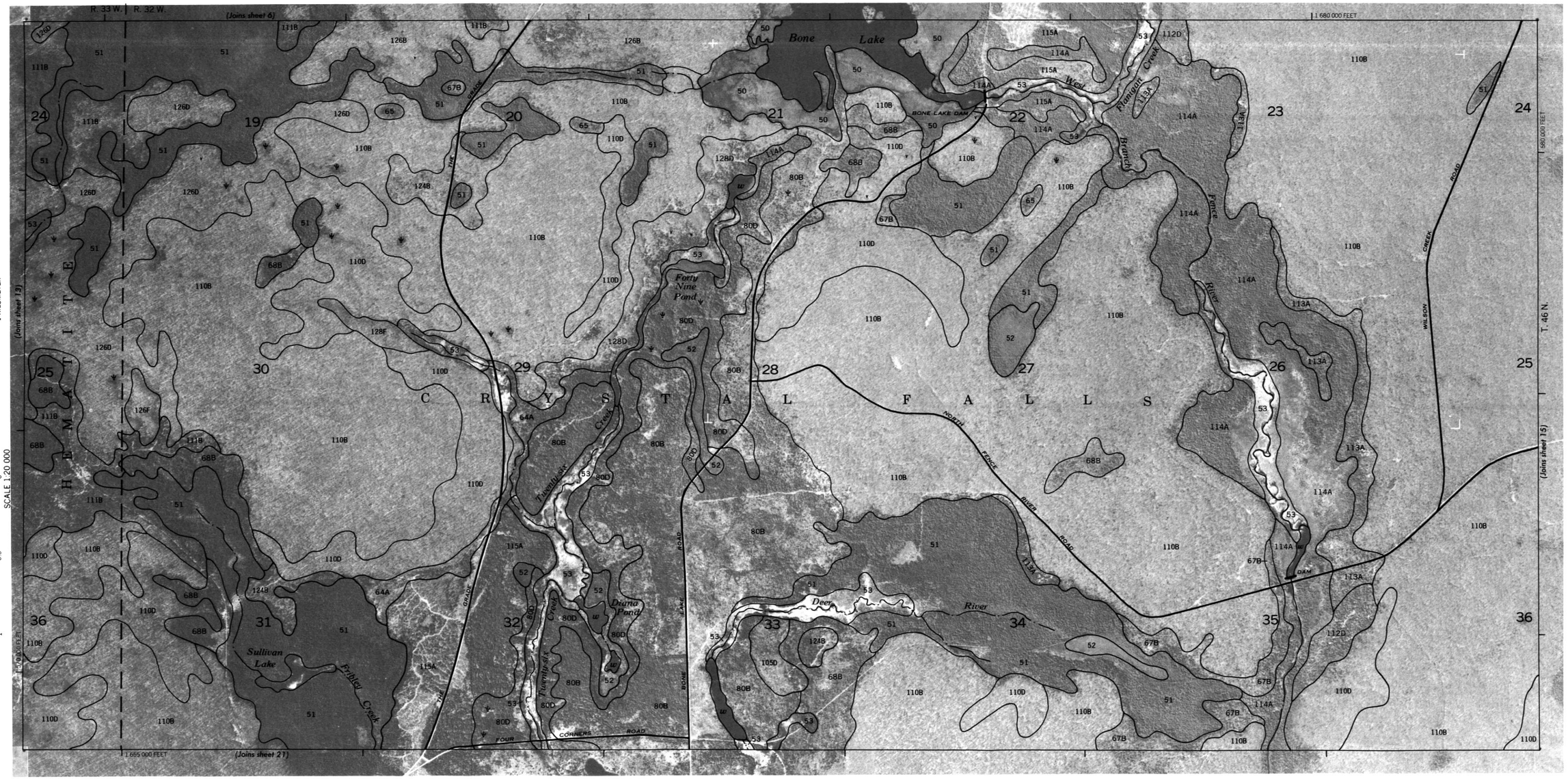
IRON COUNTY, MICHIGAN NO. 12

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



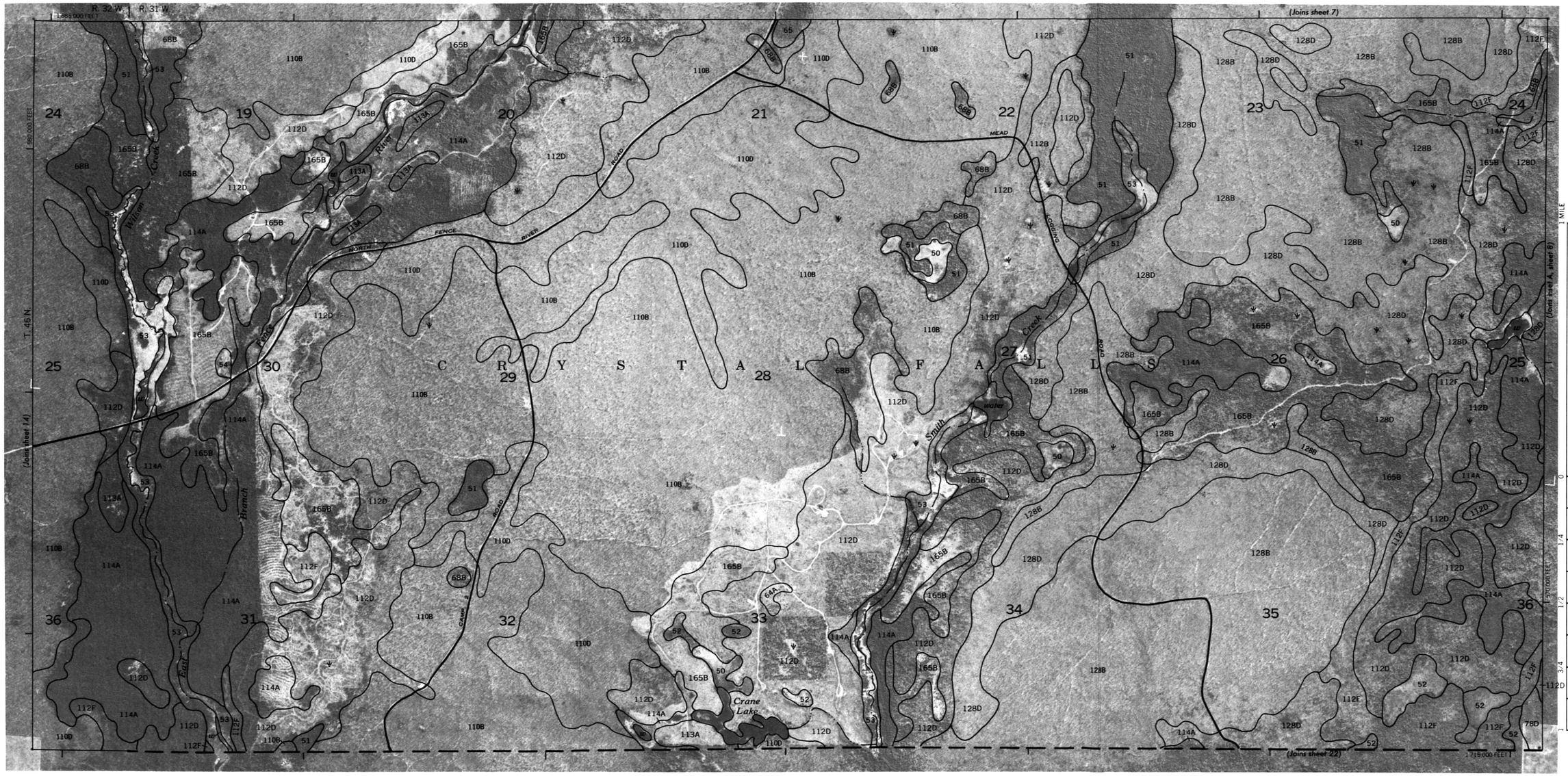
IRON COUNTY, MICHIGAN NO. 13

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 –1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 14

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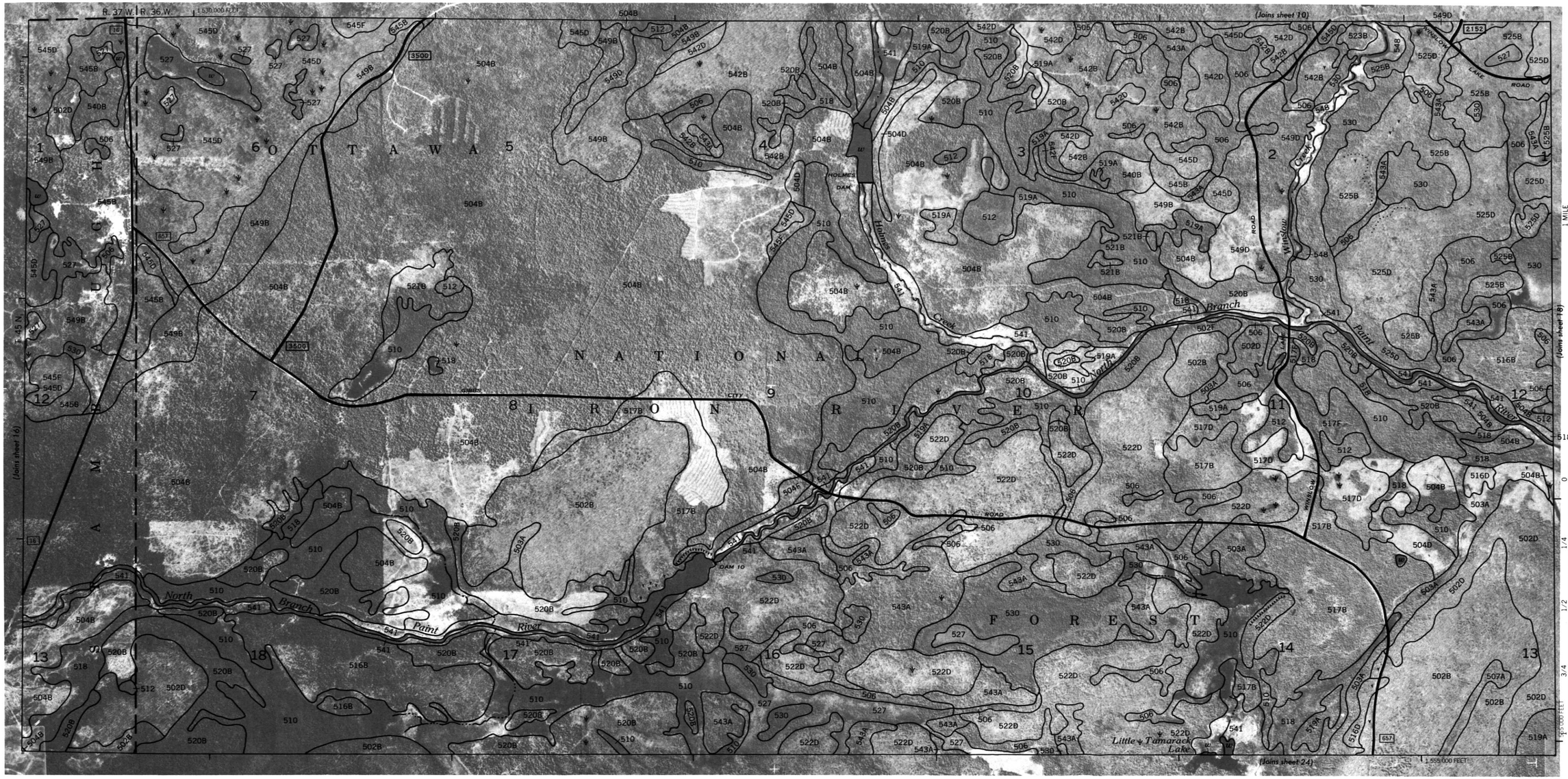
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IRON COUNTY, MICHIGAN NO. 15



IRON COUNTY, MICHIGAN NO. 16

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IRON COUNTY, MICHIGAN NO. 17

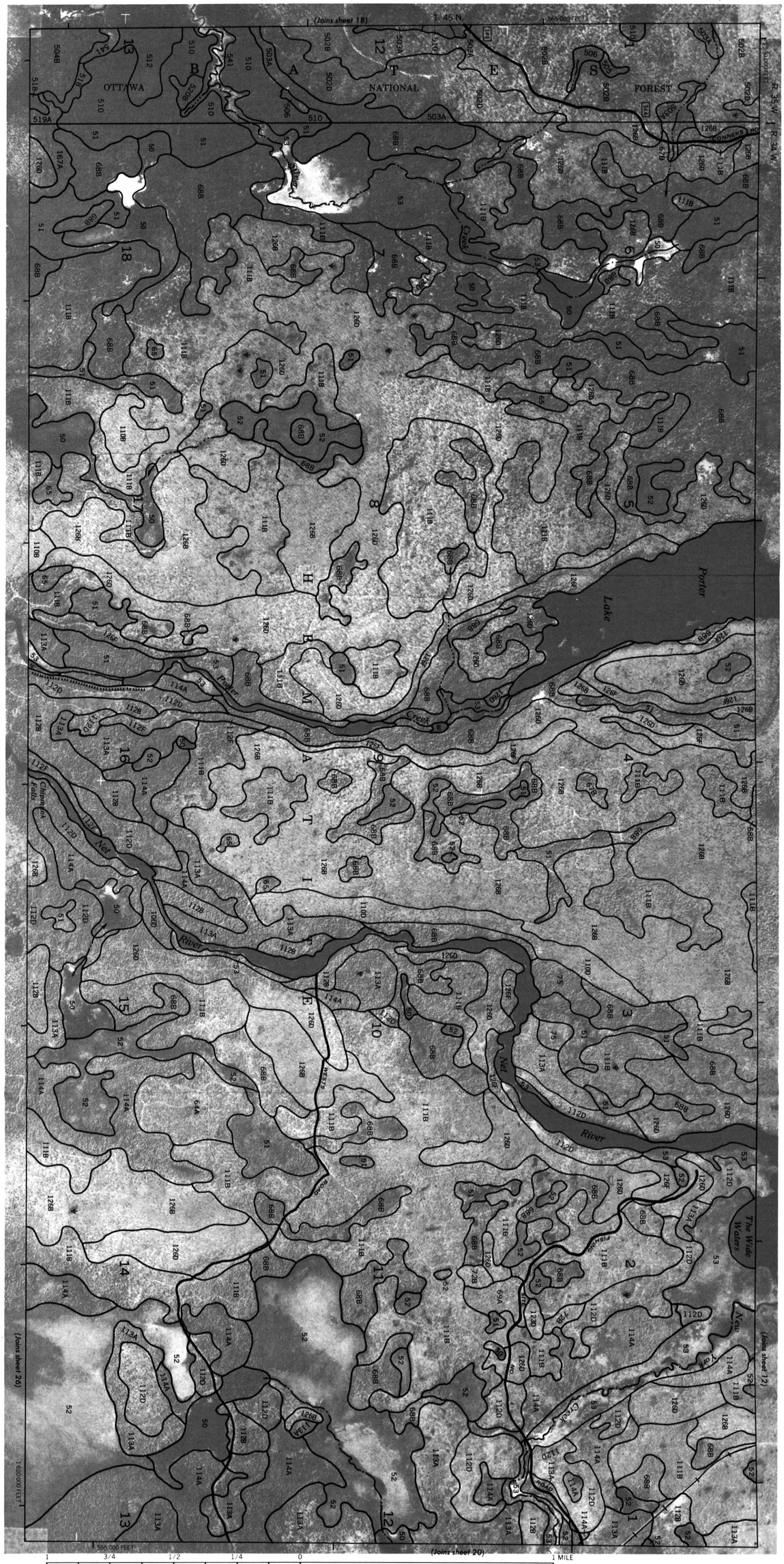


IRON COUNTY, MICHIGAN NO. 18

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IRON COUNTY, MICHIGAN NO. 19



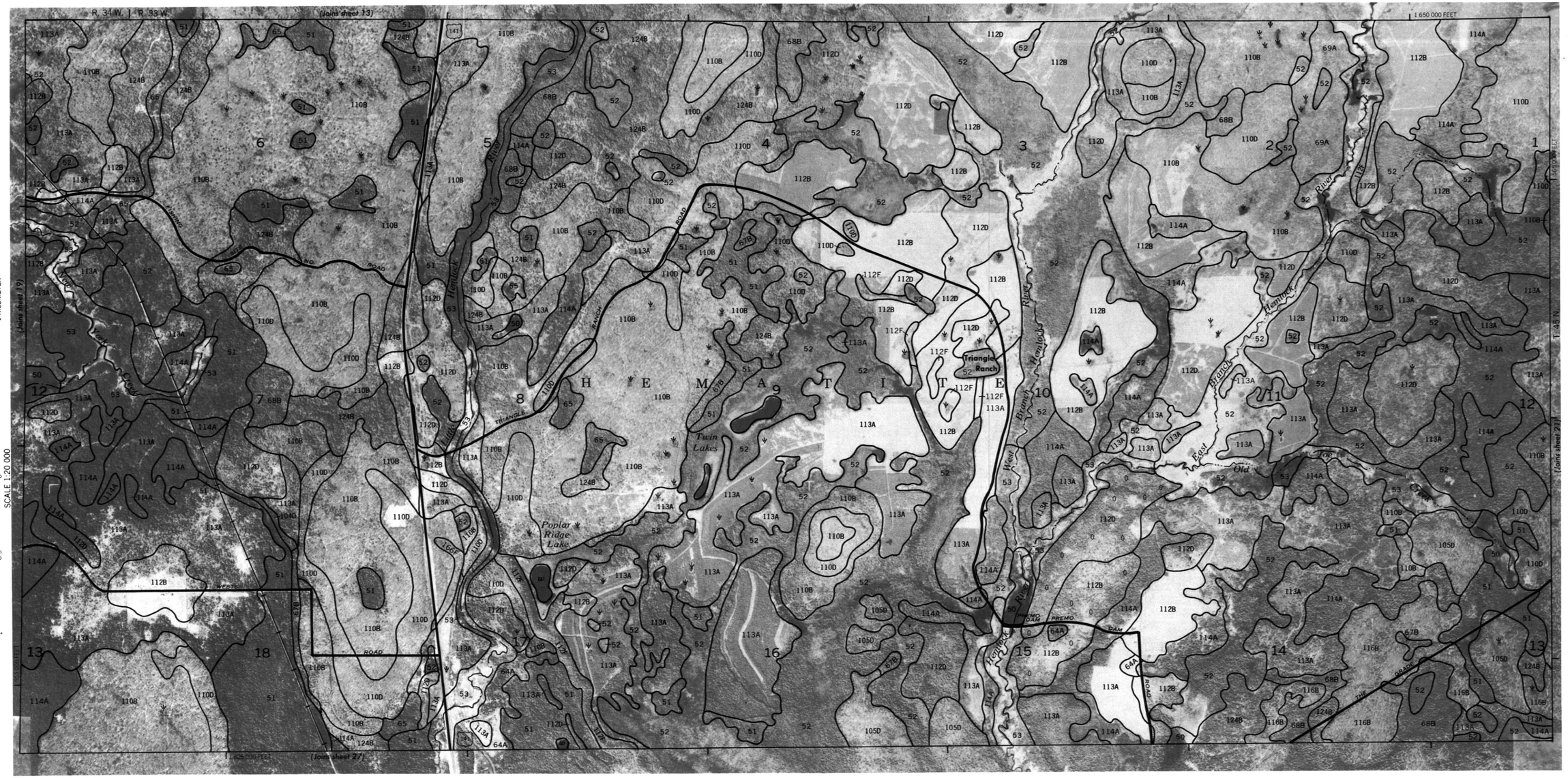
SOIL SURVEY OF IRON COUNTY, MICHIGAN — SHEET NUMBER 19

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

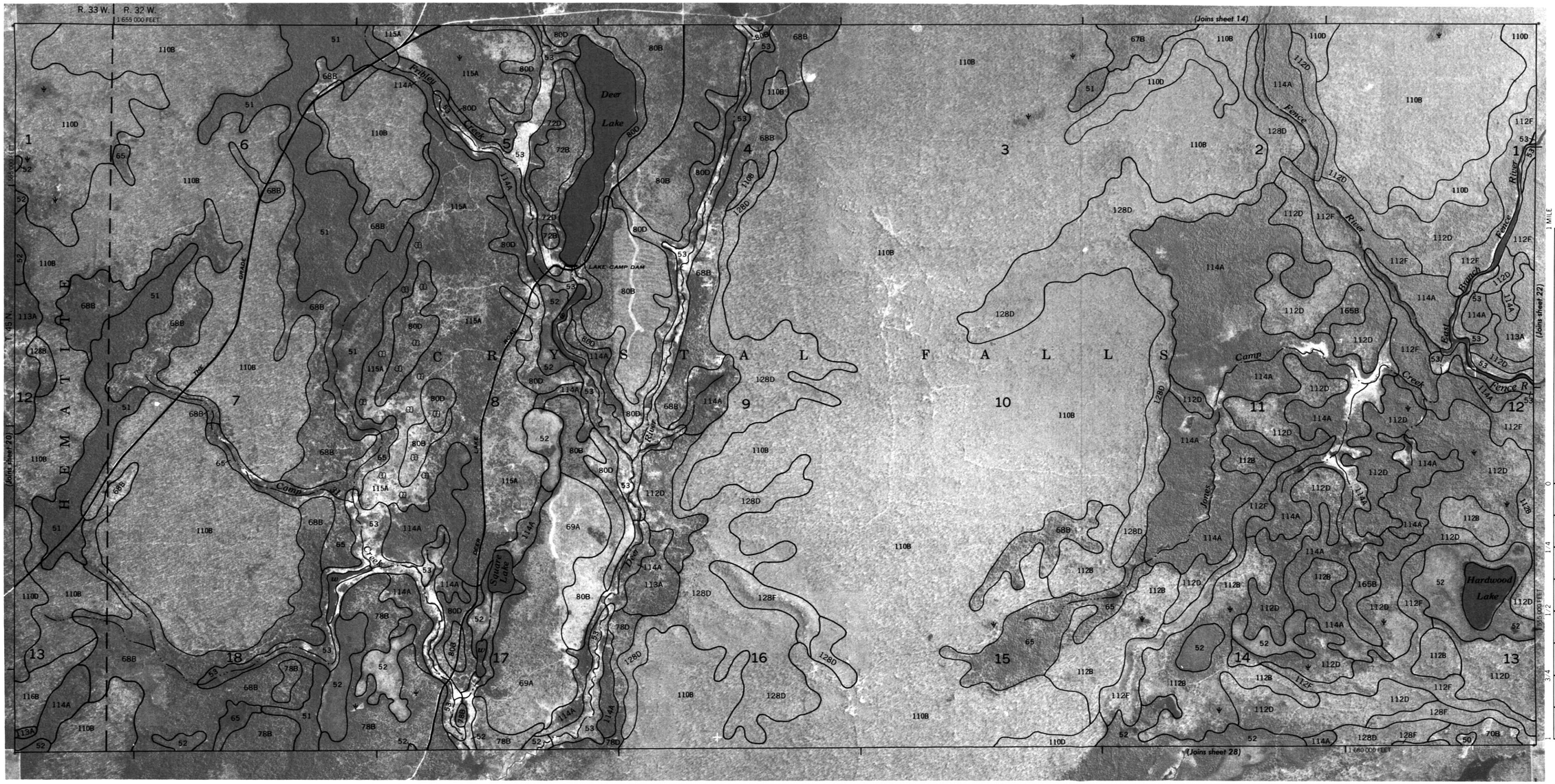
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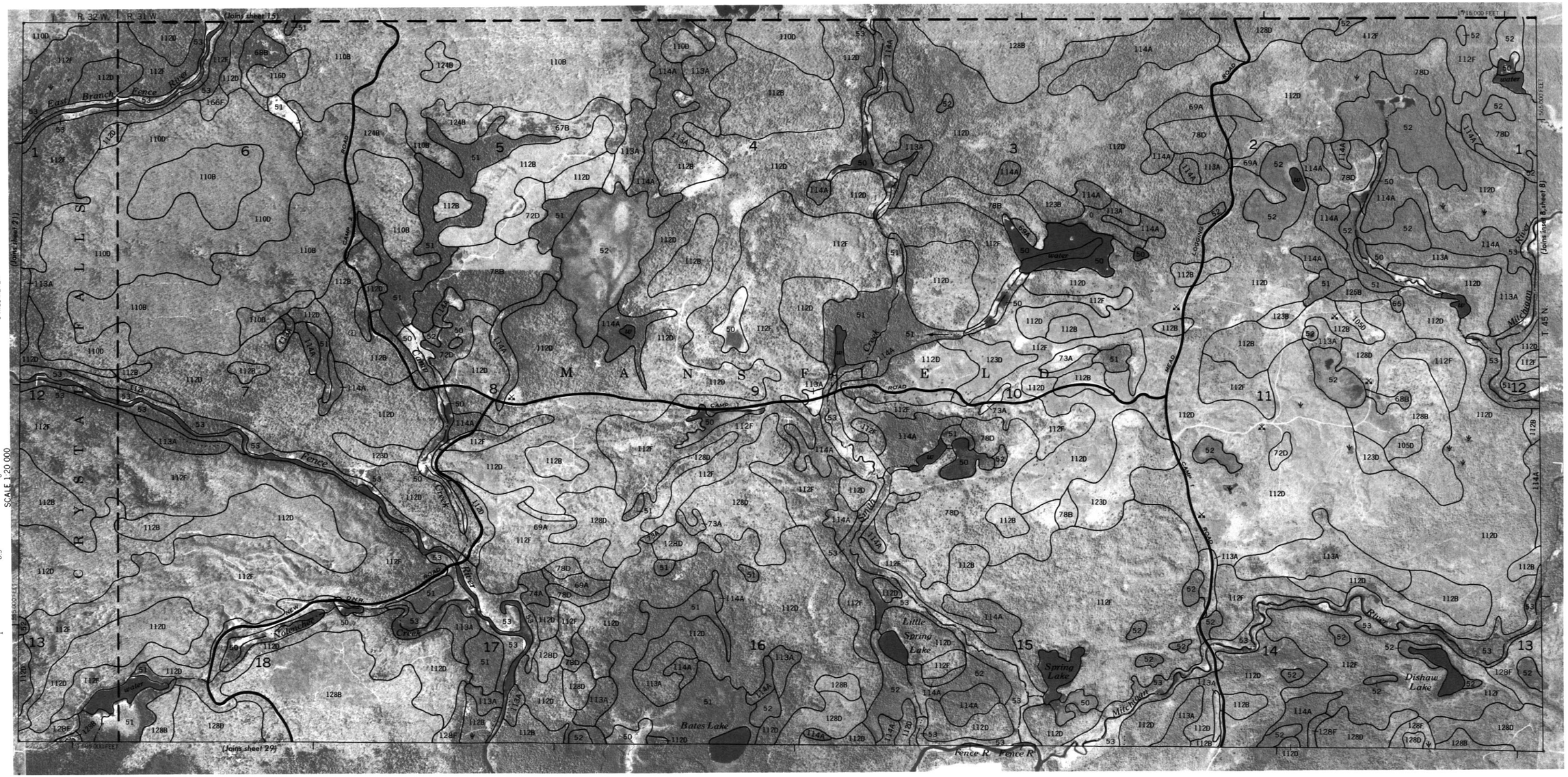
IRON COUNTY, MICHIGAN NO. 20

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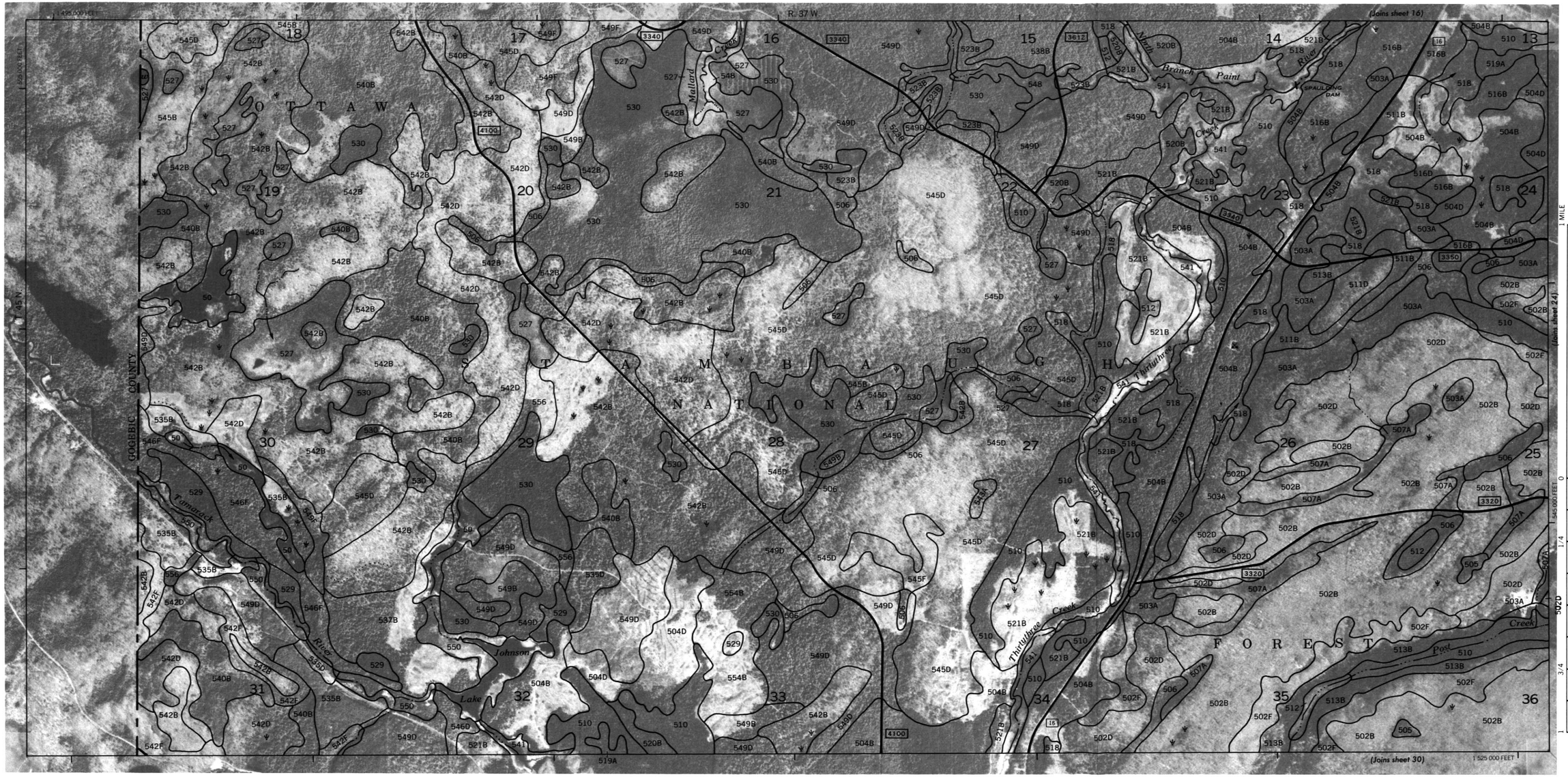
IRON COUNTY, MICHIGAN NO. 21

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



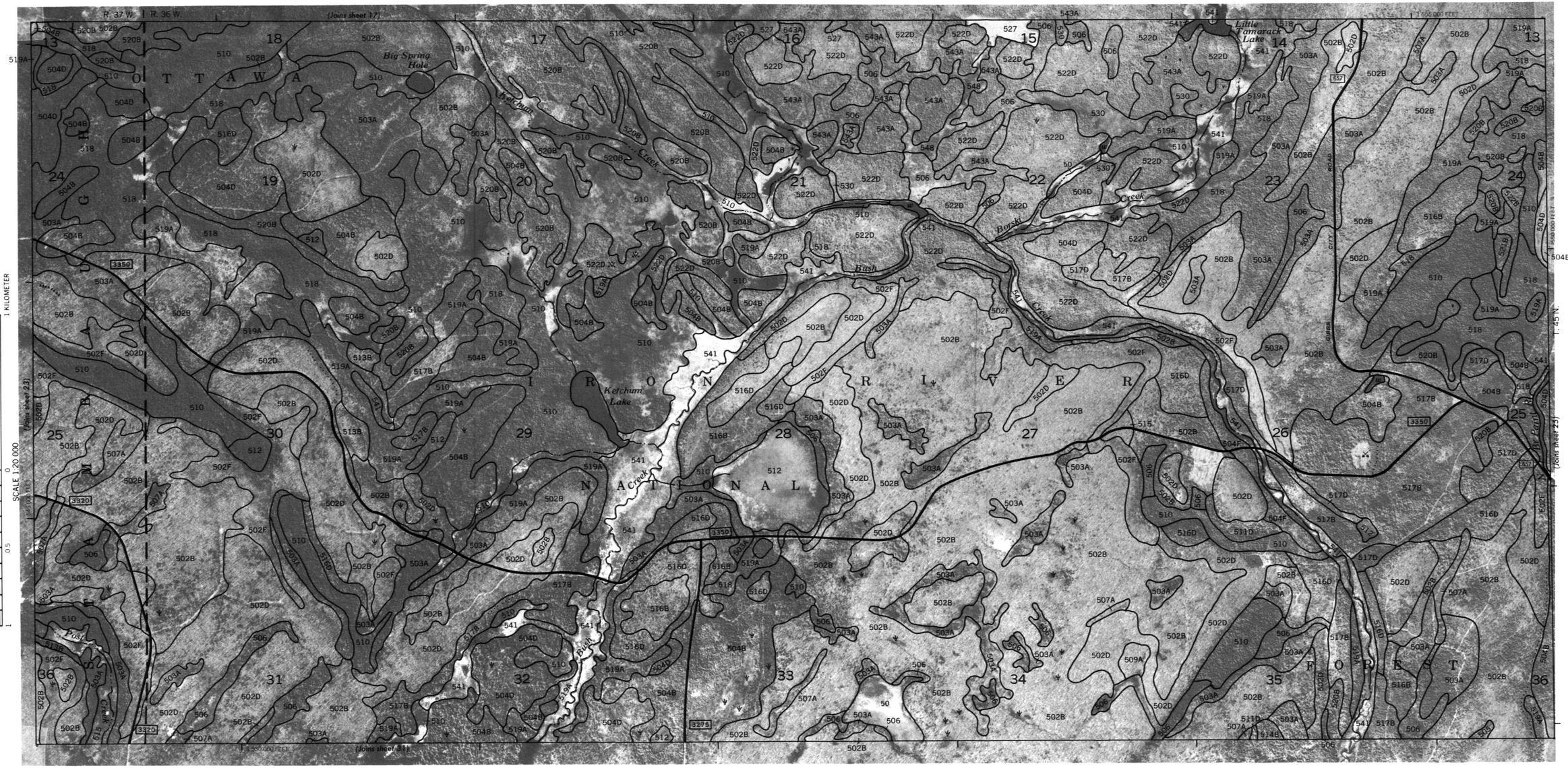
IRON COUNTY, MICHIGAN NO. 22

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



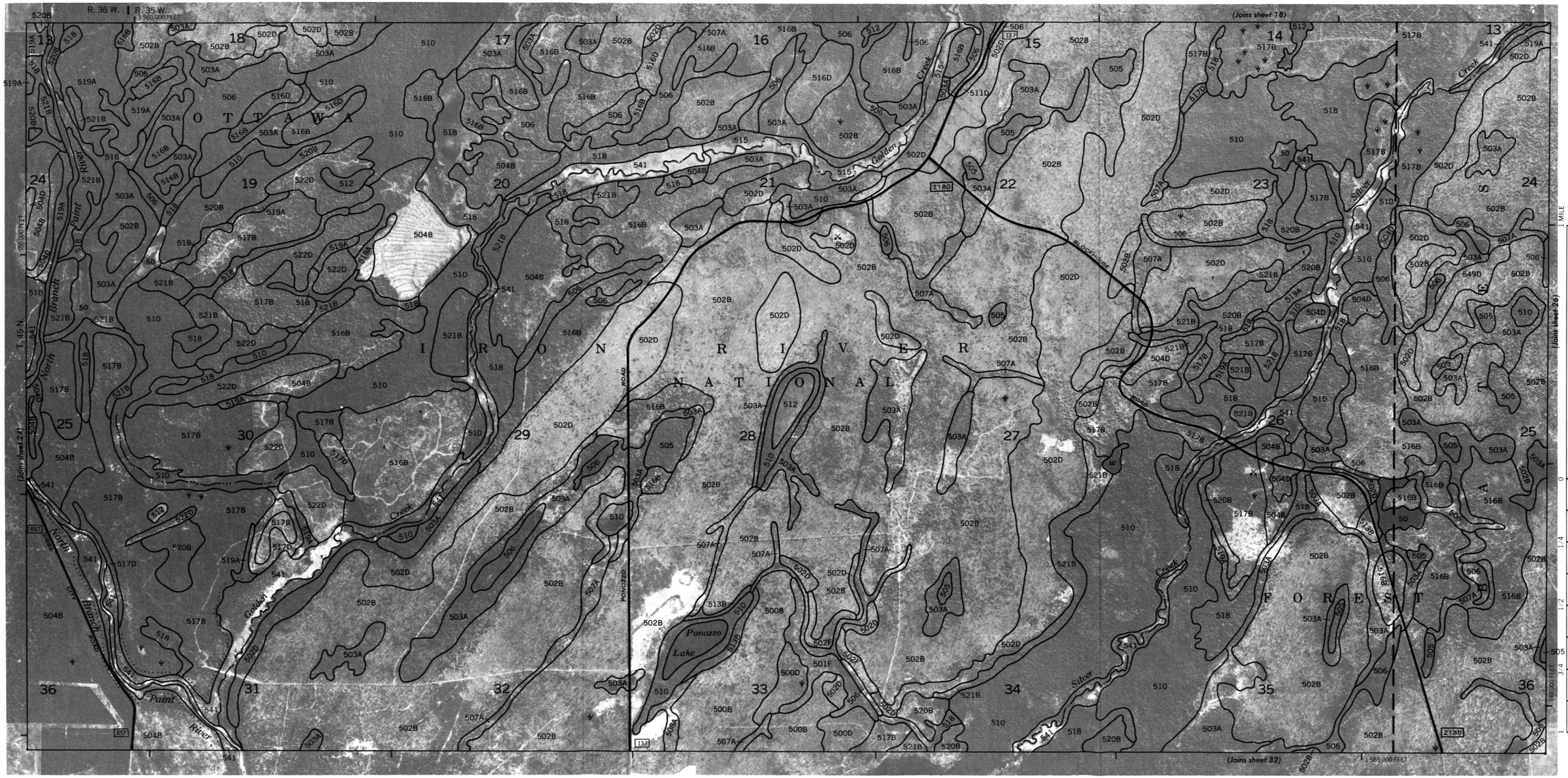
IRON COUNTY, MICHIGAN NO. 23

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



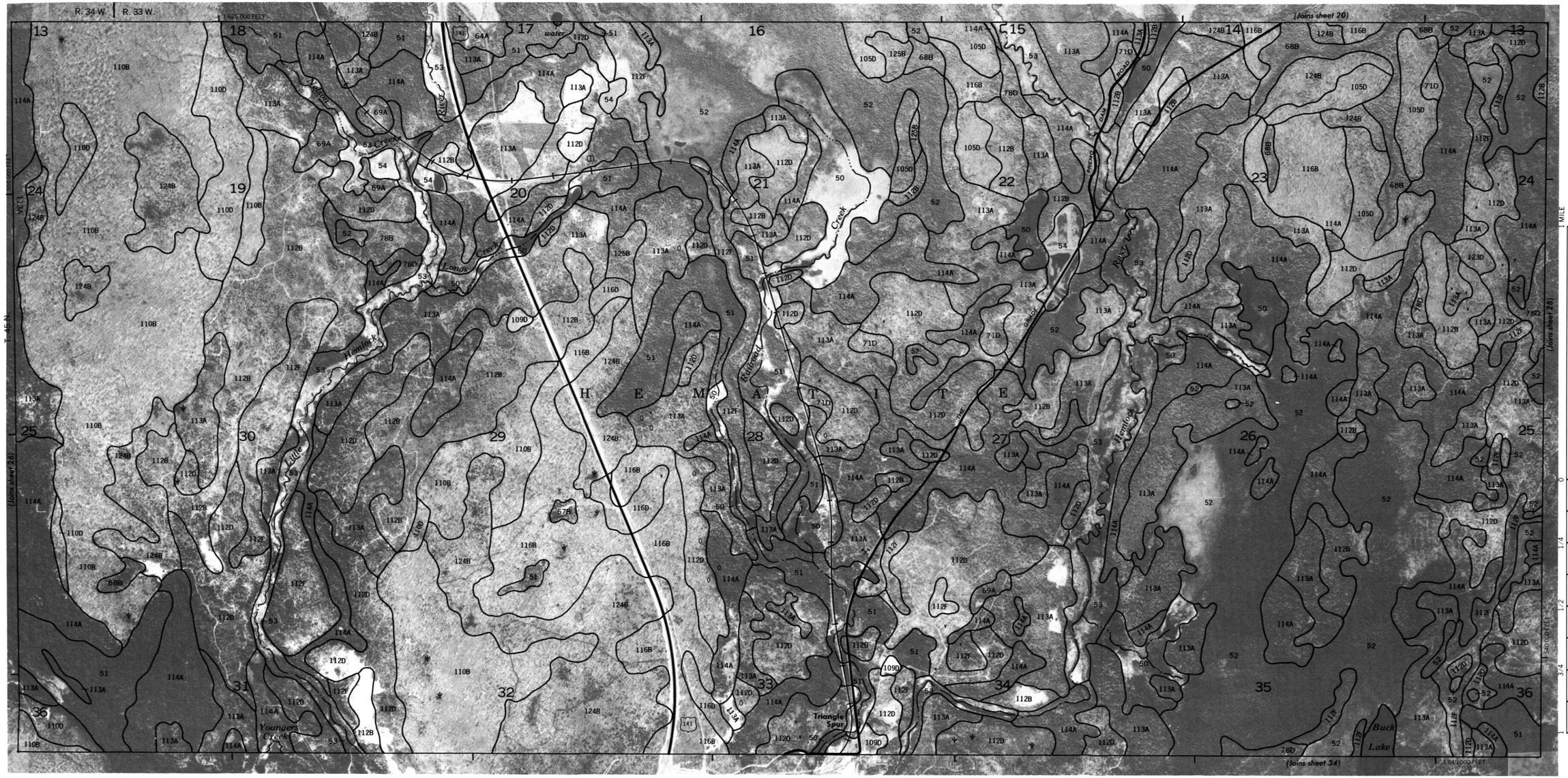
IRON COUNTY, MICHIGAN NO. 25

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



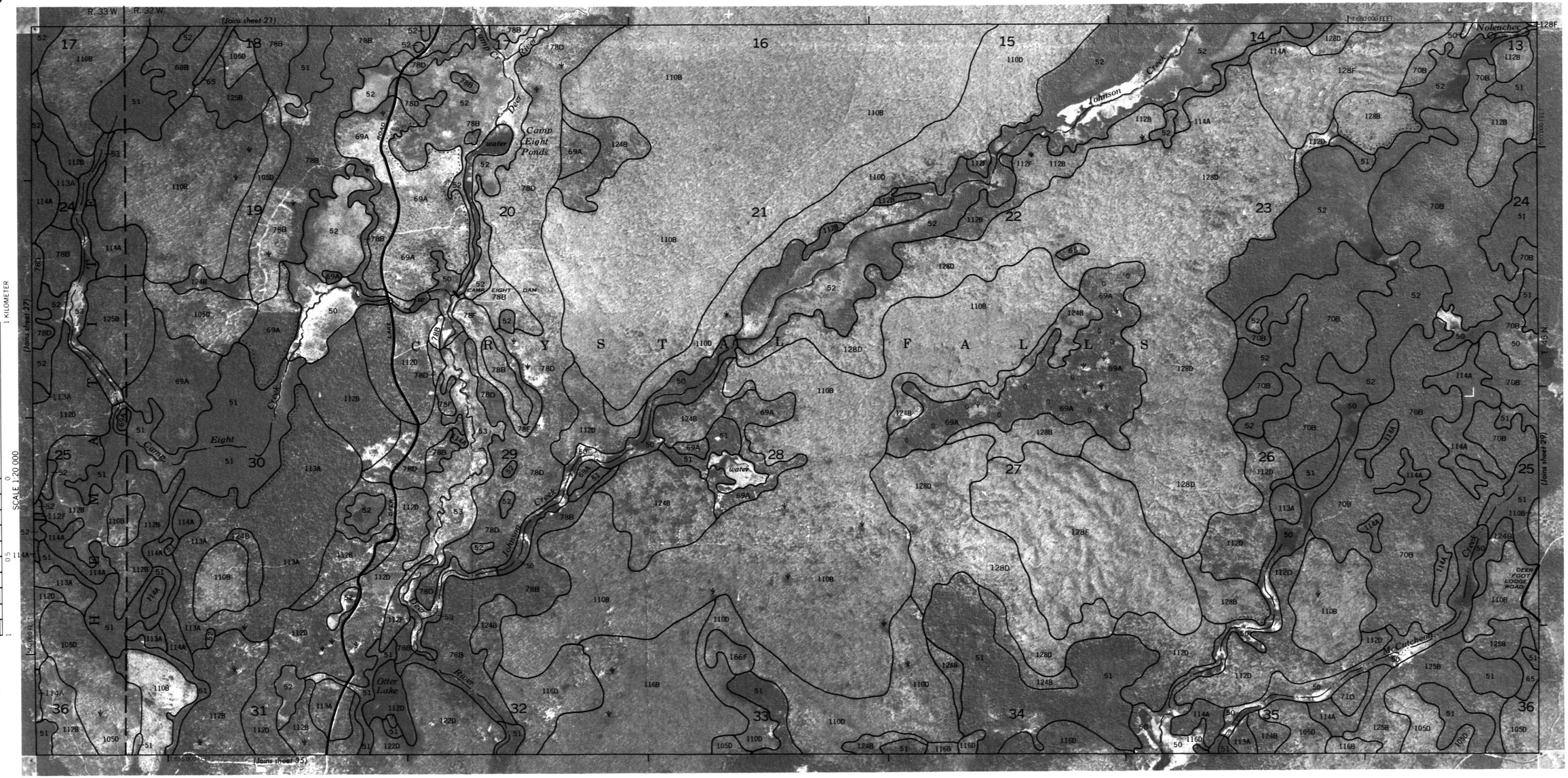
IRON COUNTY, MICHIGAN NO. 26

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



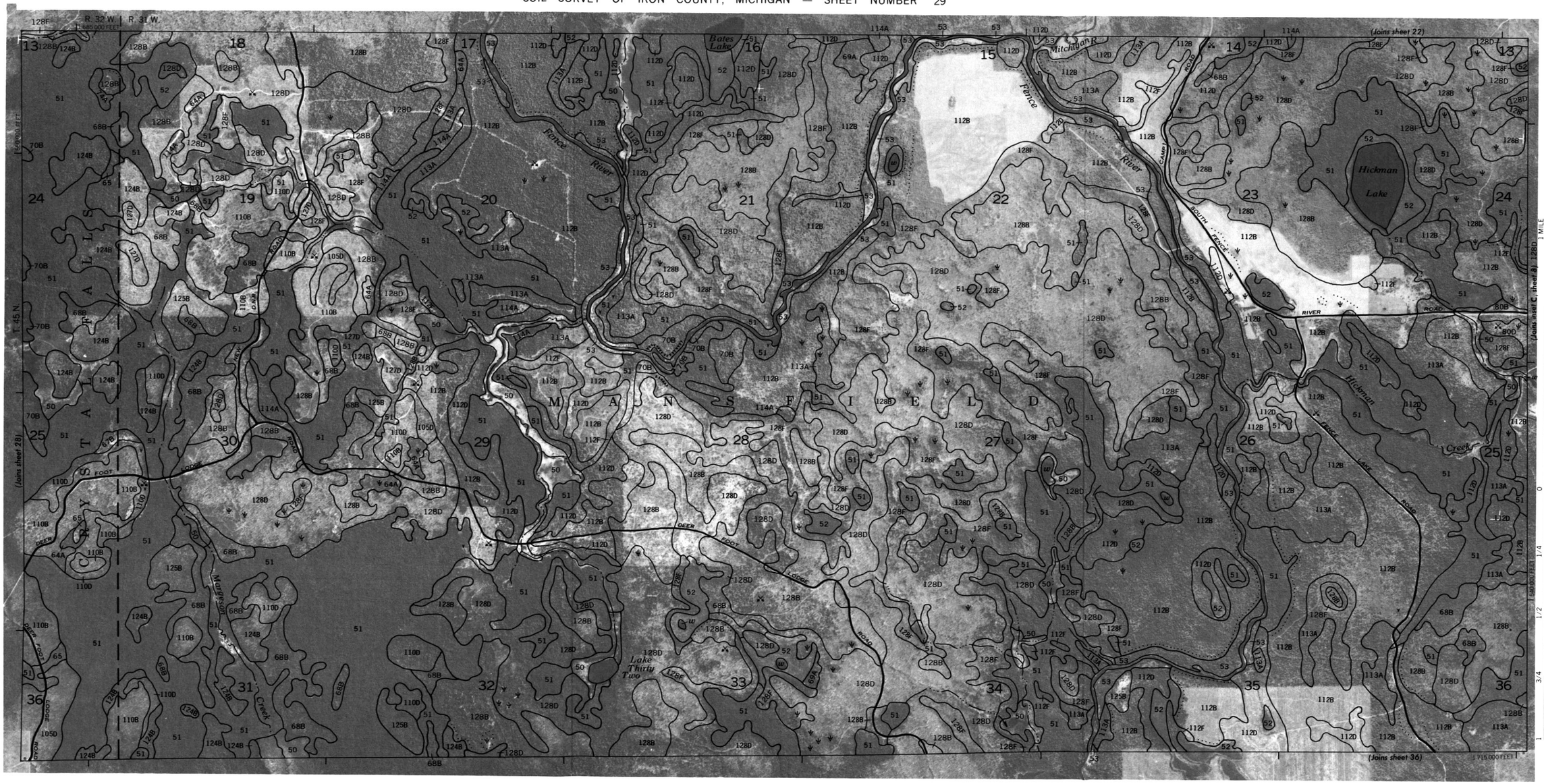
IRON COUNTY, MICHIGAN NO. 27

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 28

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



29

N

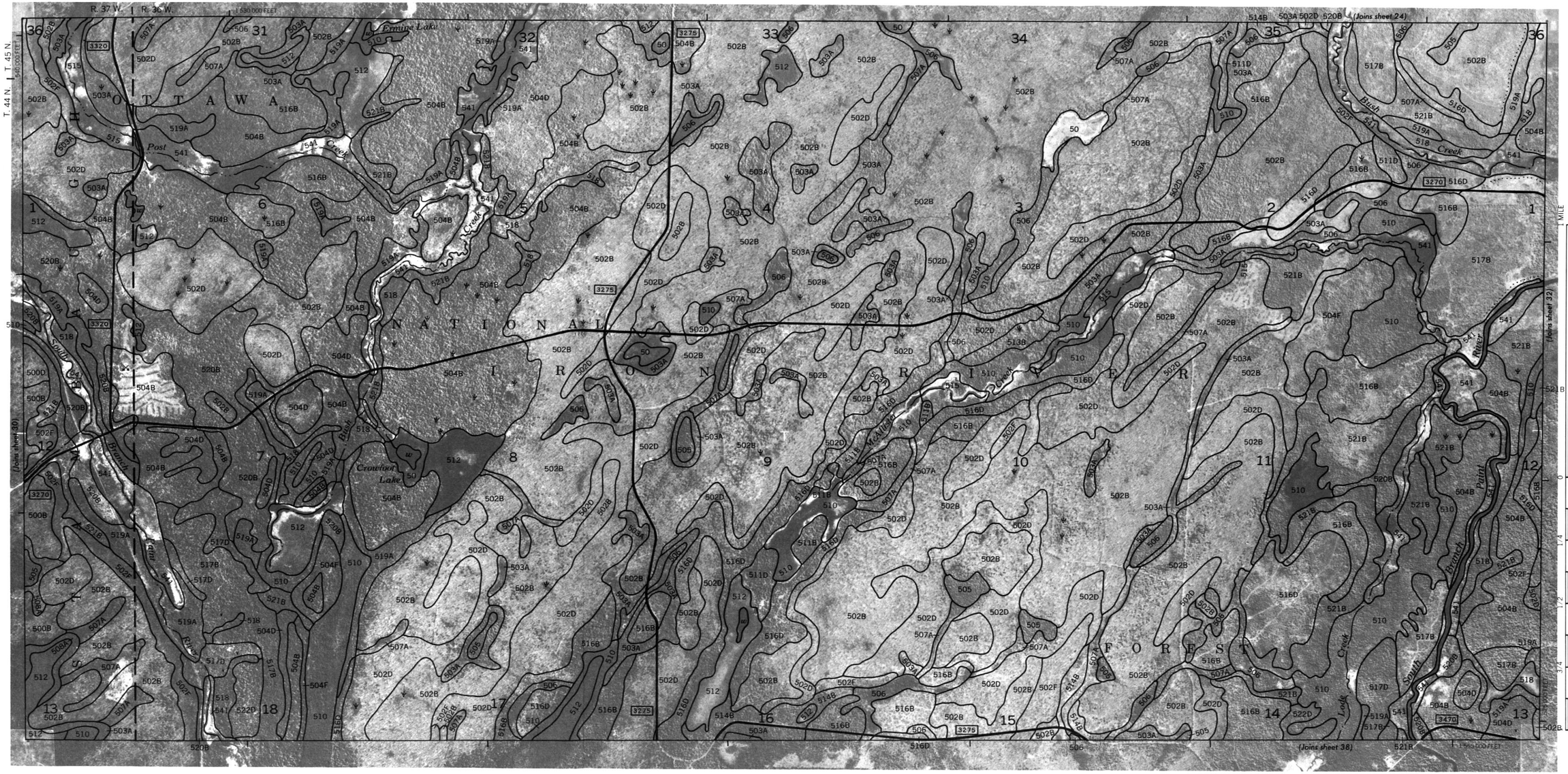
IRON COUNTY, MICHIGAN NO. 29

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 30

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 31

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



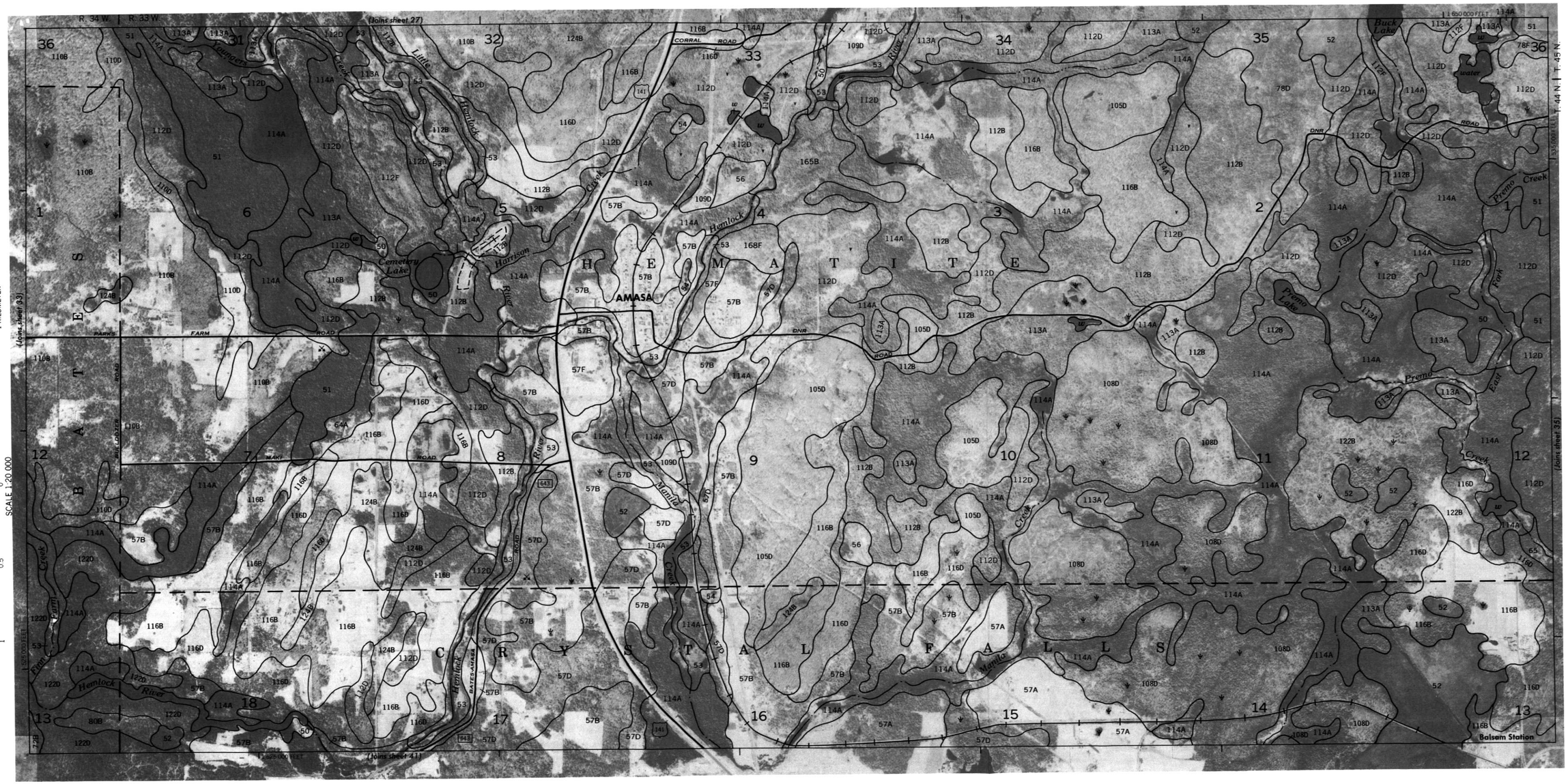
IRON COUNTY, MICHIGAN NO. 32

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



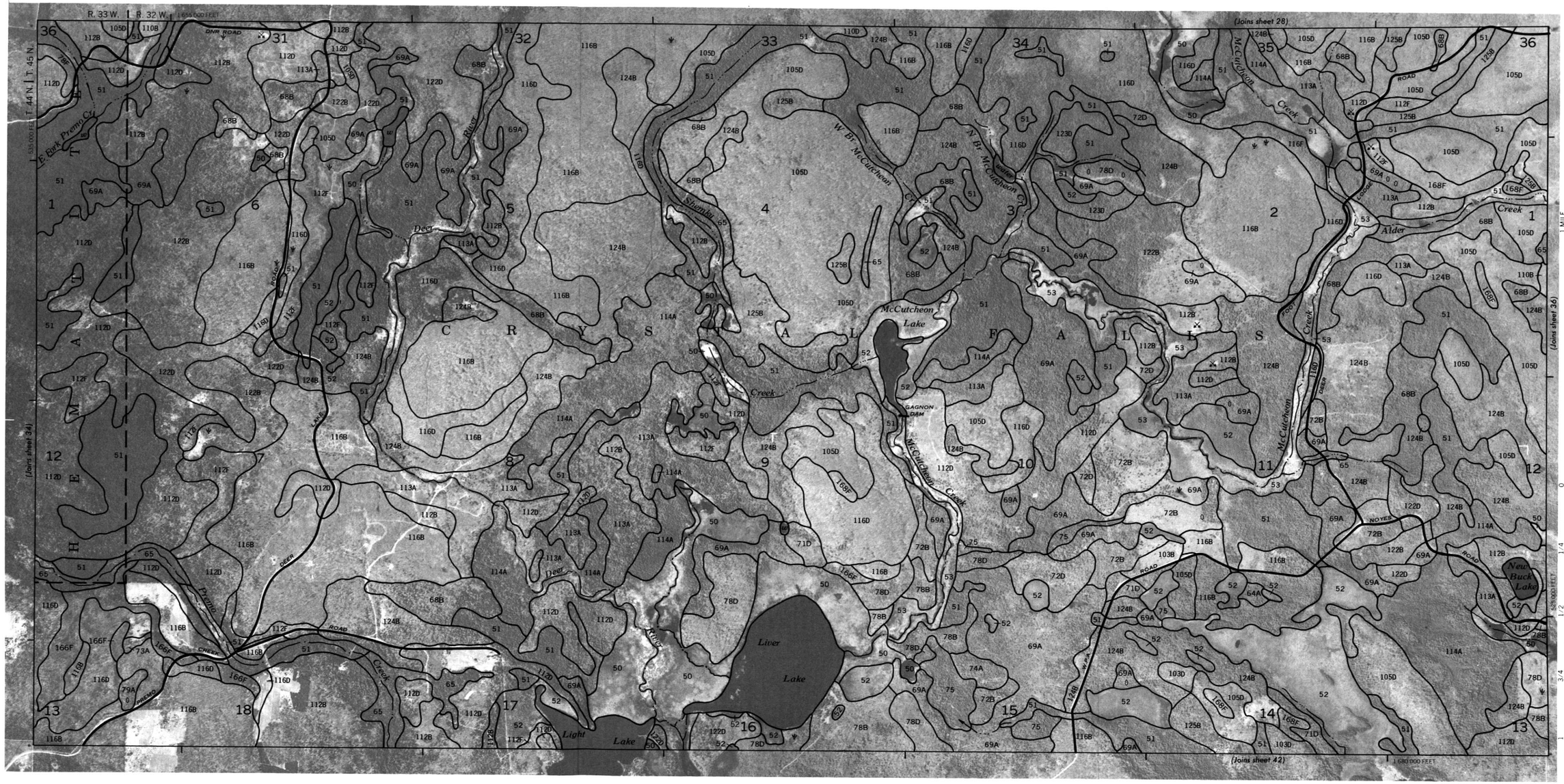
IRON COUNTY, MICHIGAN NO. 33

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



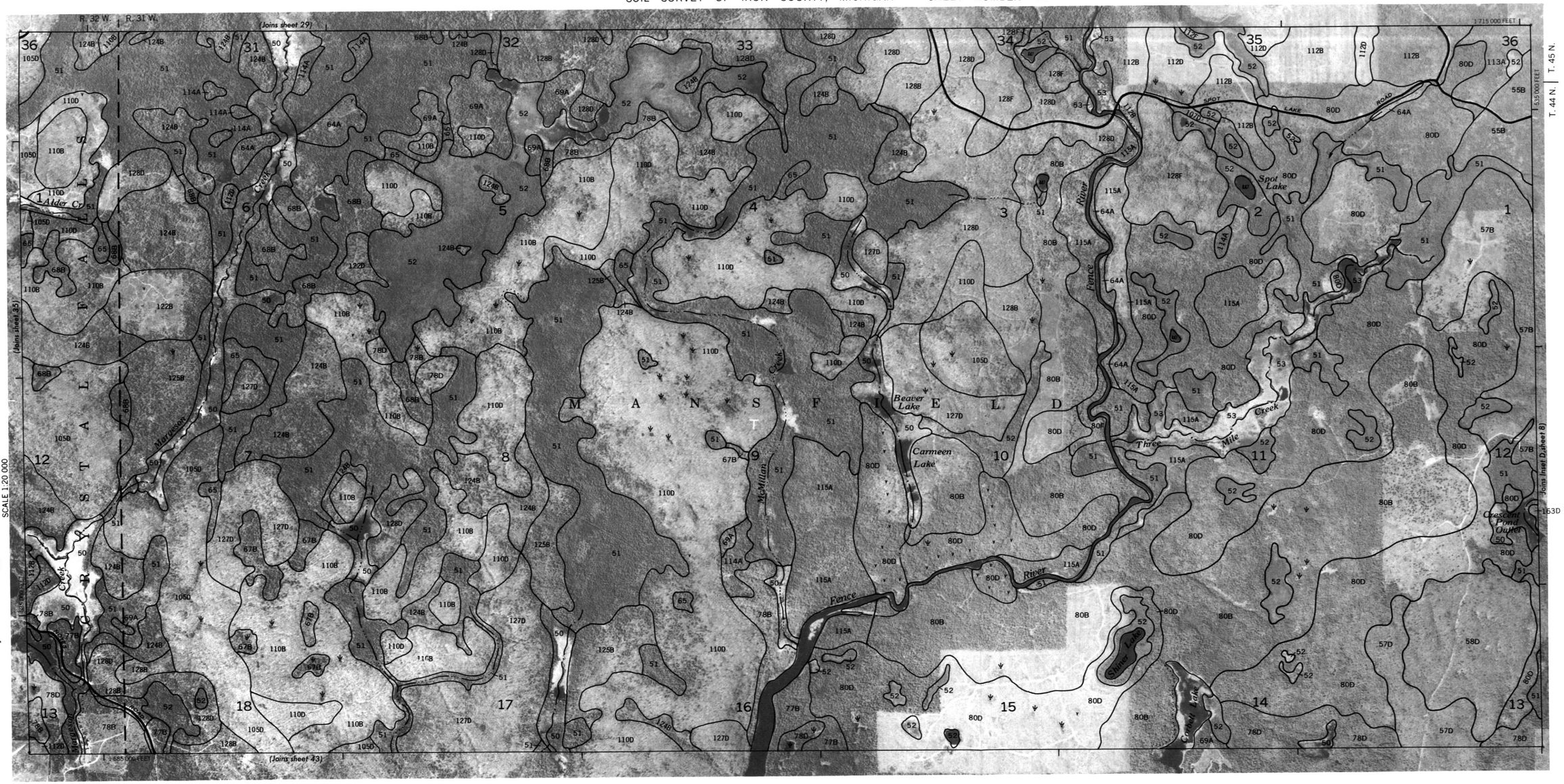
IRON COUNTY, MICHIGAN NO. 34

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1960 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



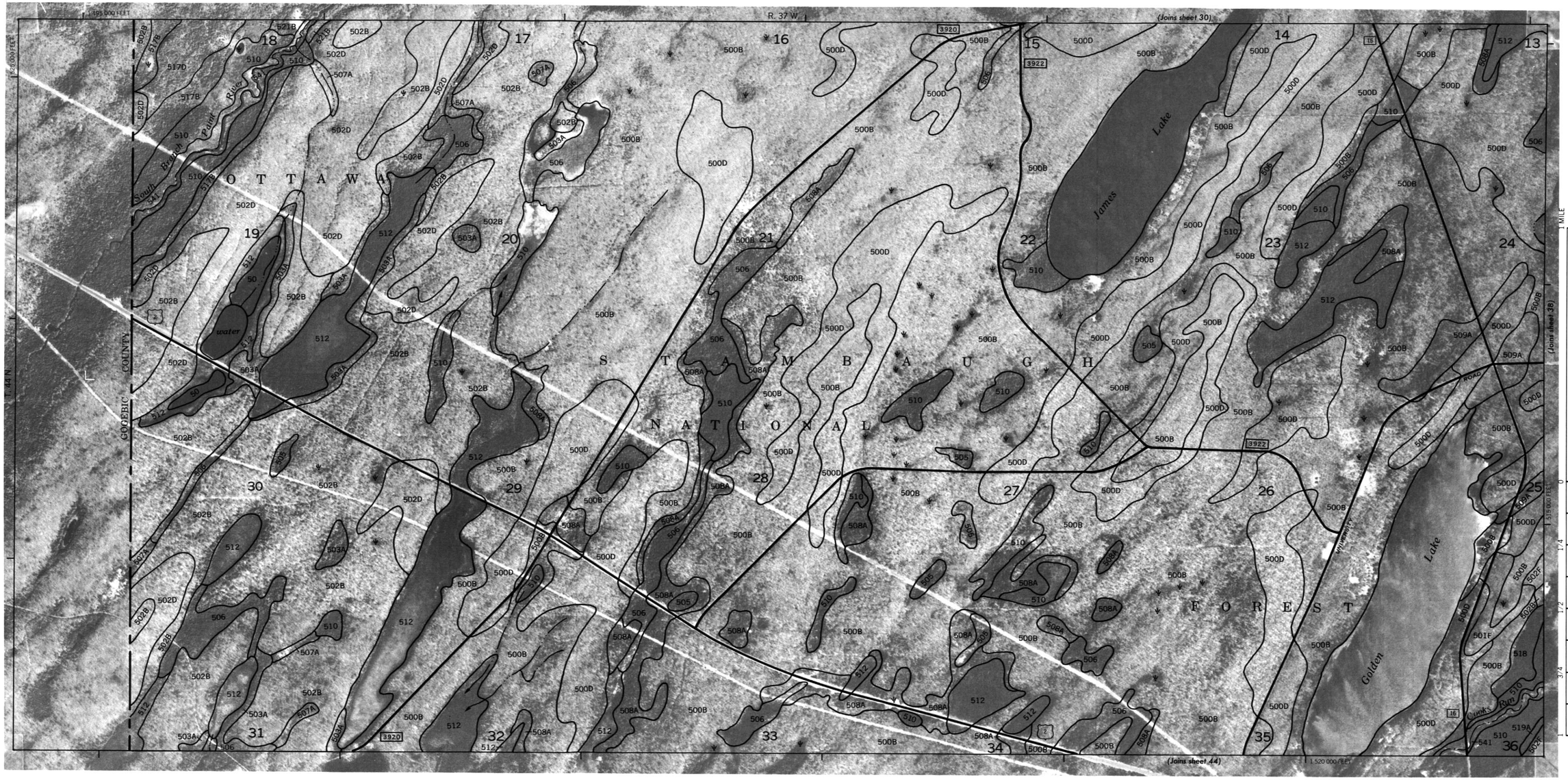
IRON COUNTY, MICHIGAN NO. 35

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



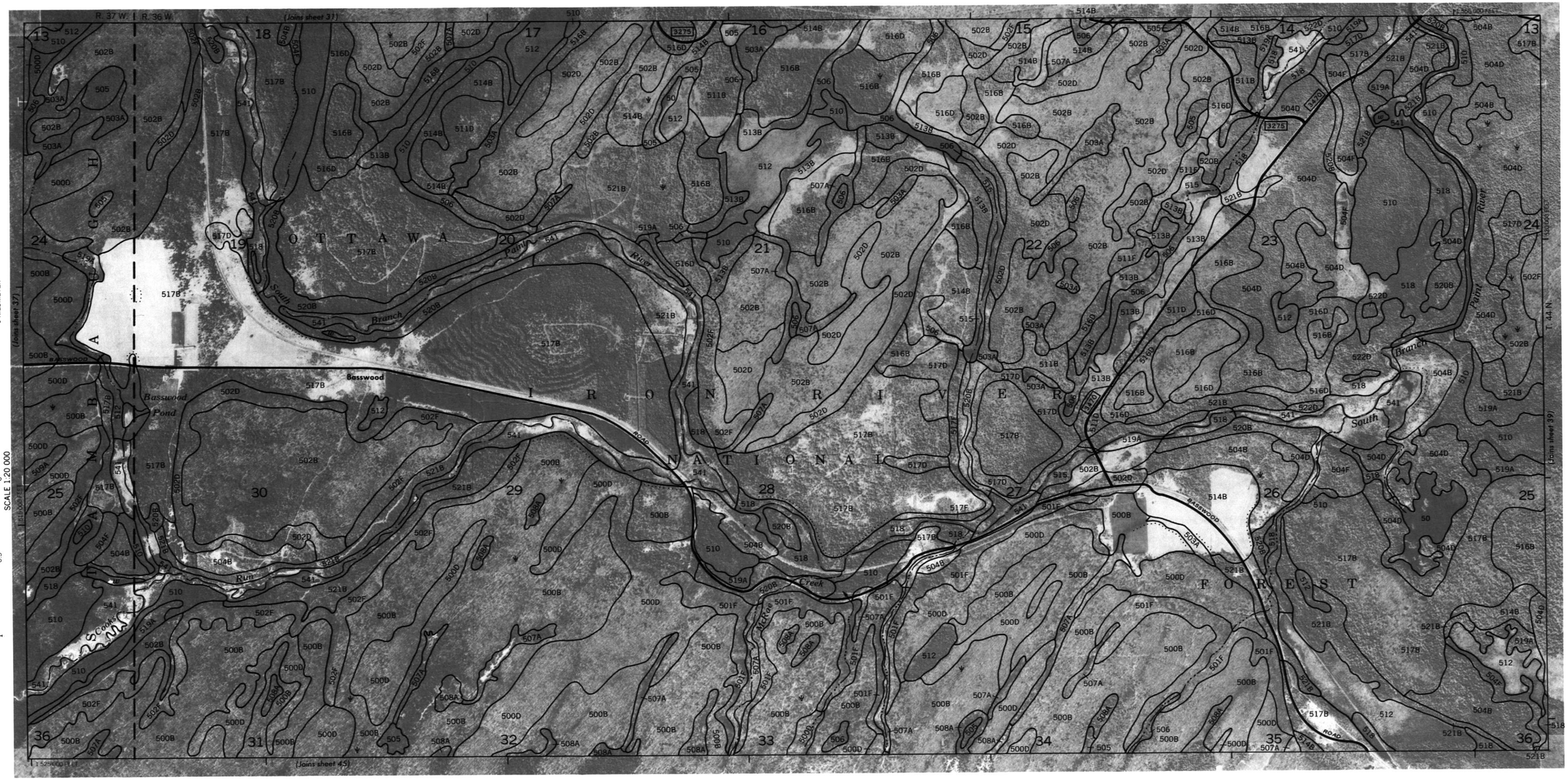
IRON COUNTY, MICHIGAN NO. 36

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



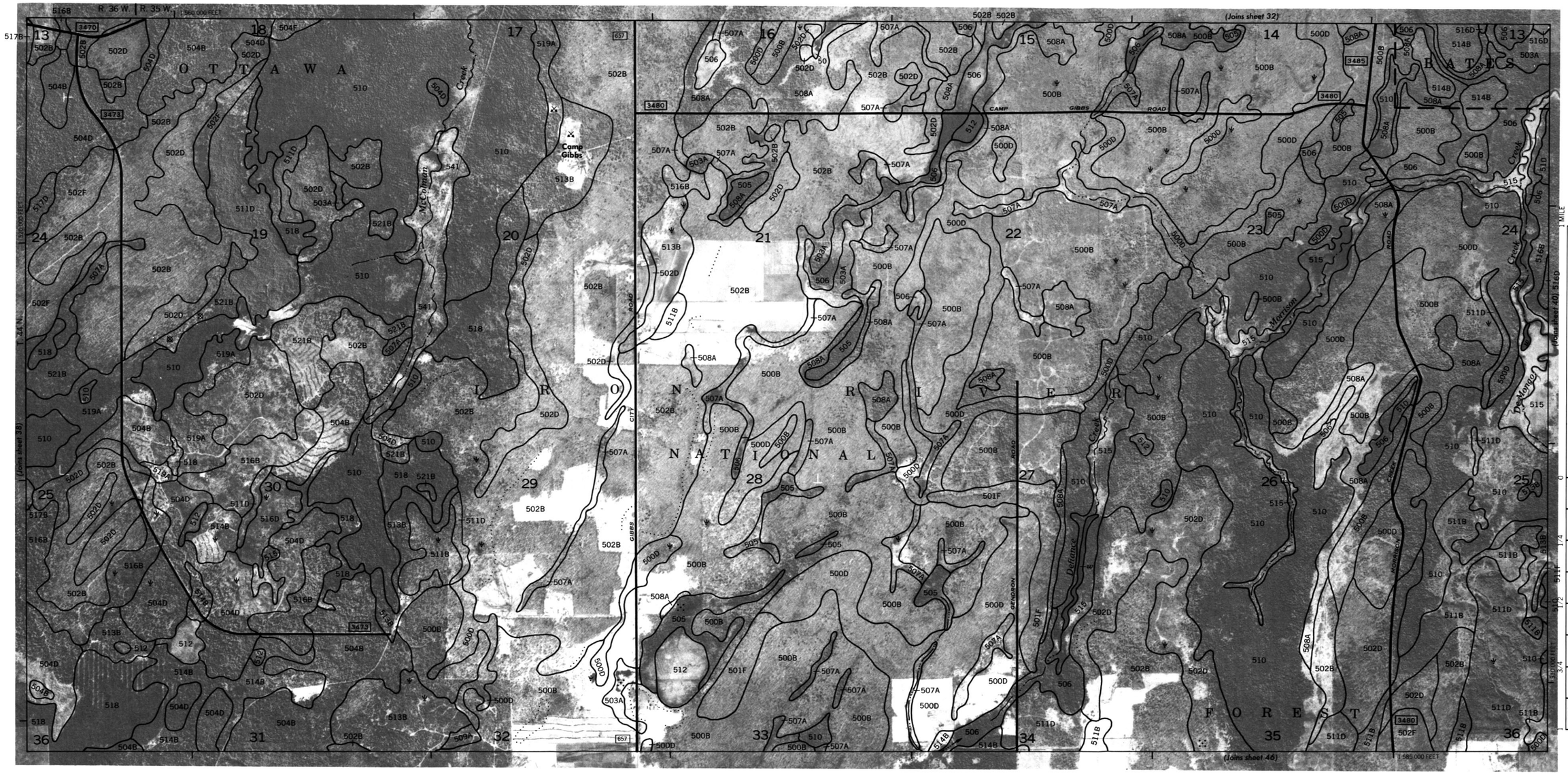
IRON COUNTY, MICHIGAN NO. 37

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



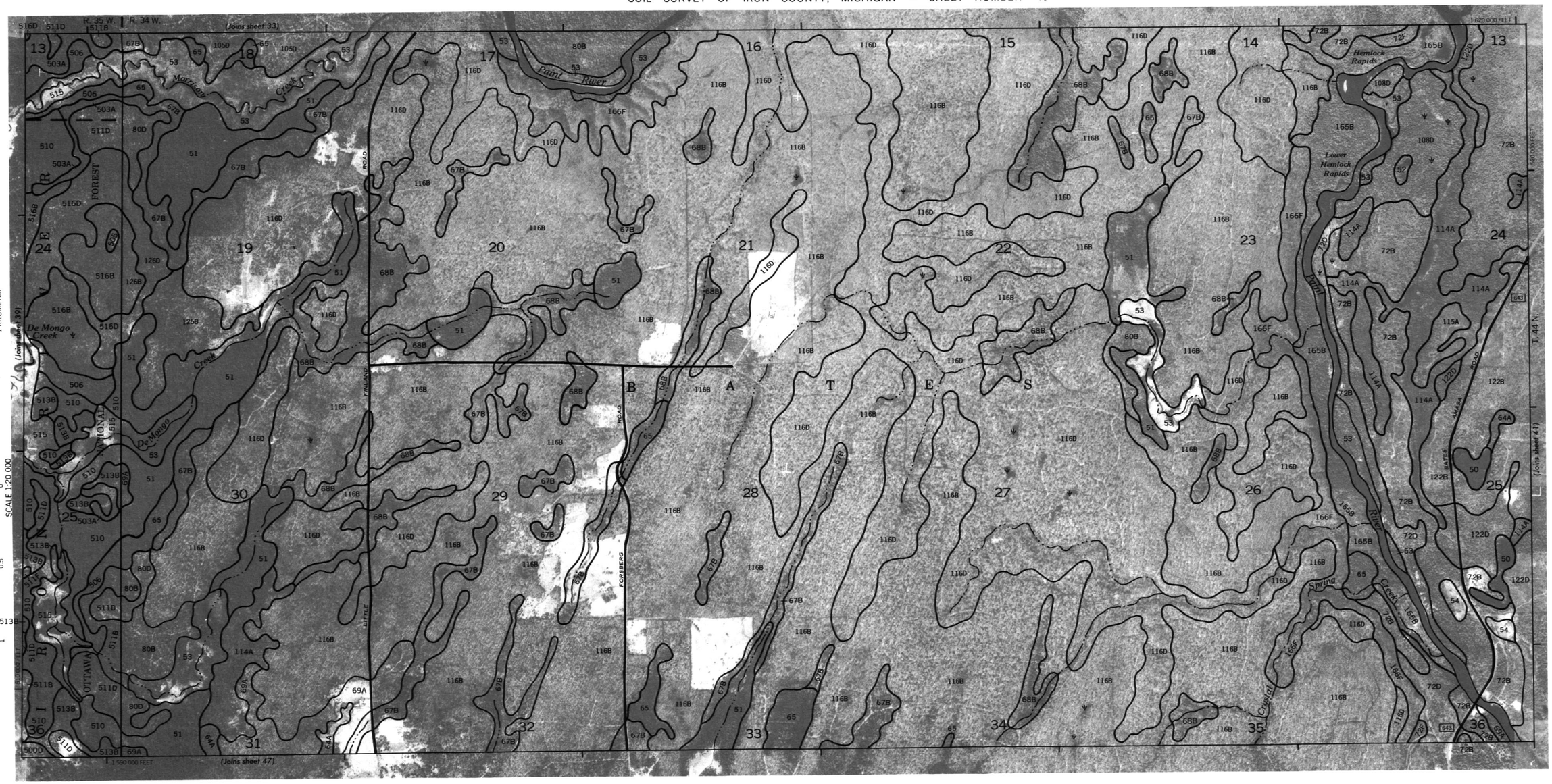
IRON COUNTY, MICHIGAN NO. 38

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



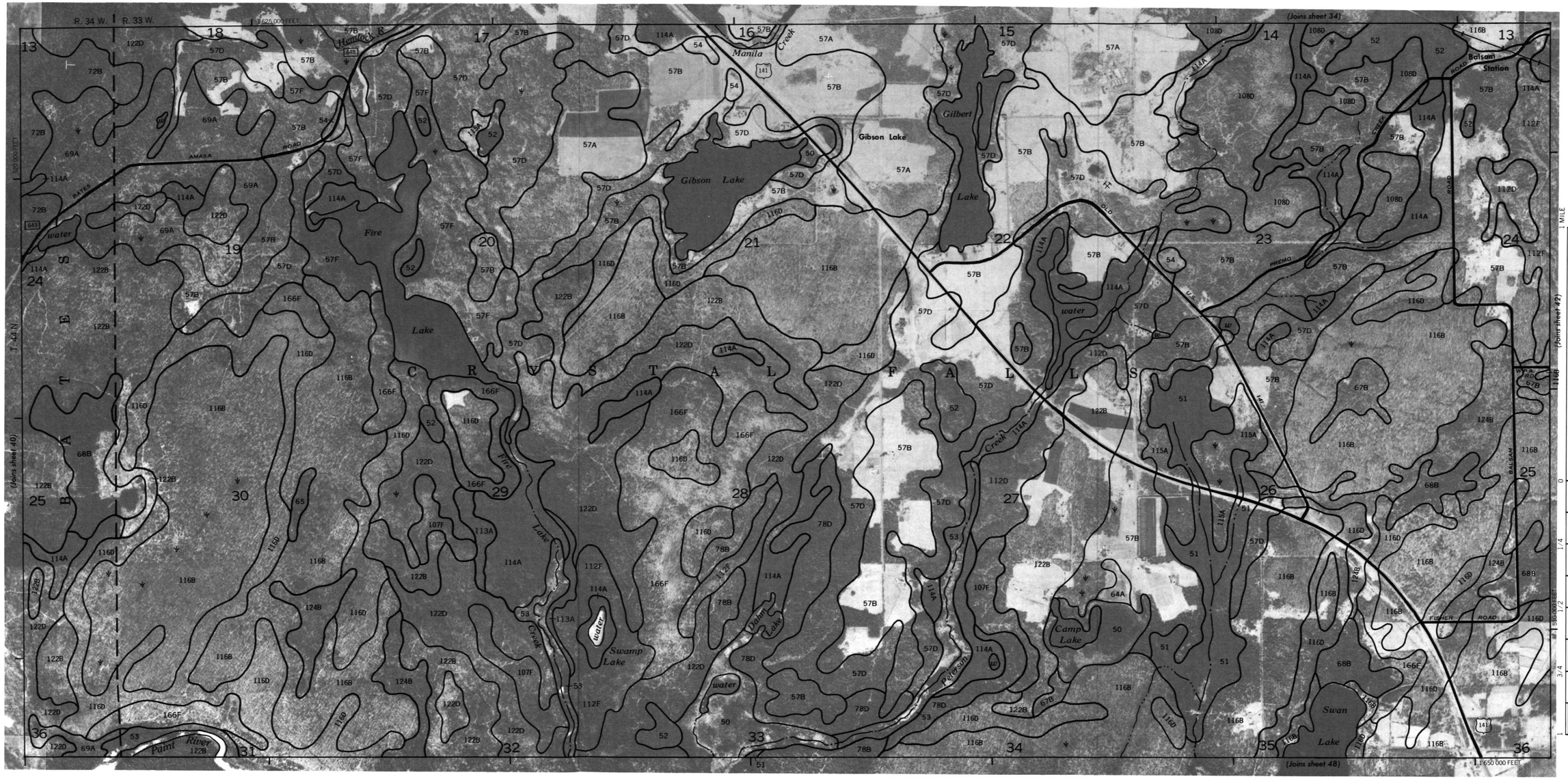
IRON COUNTY, MICHIGAN NO. 39

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 40

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 41

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 42

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



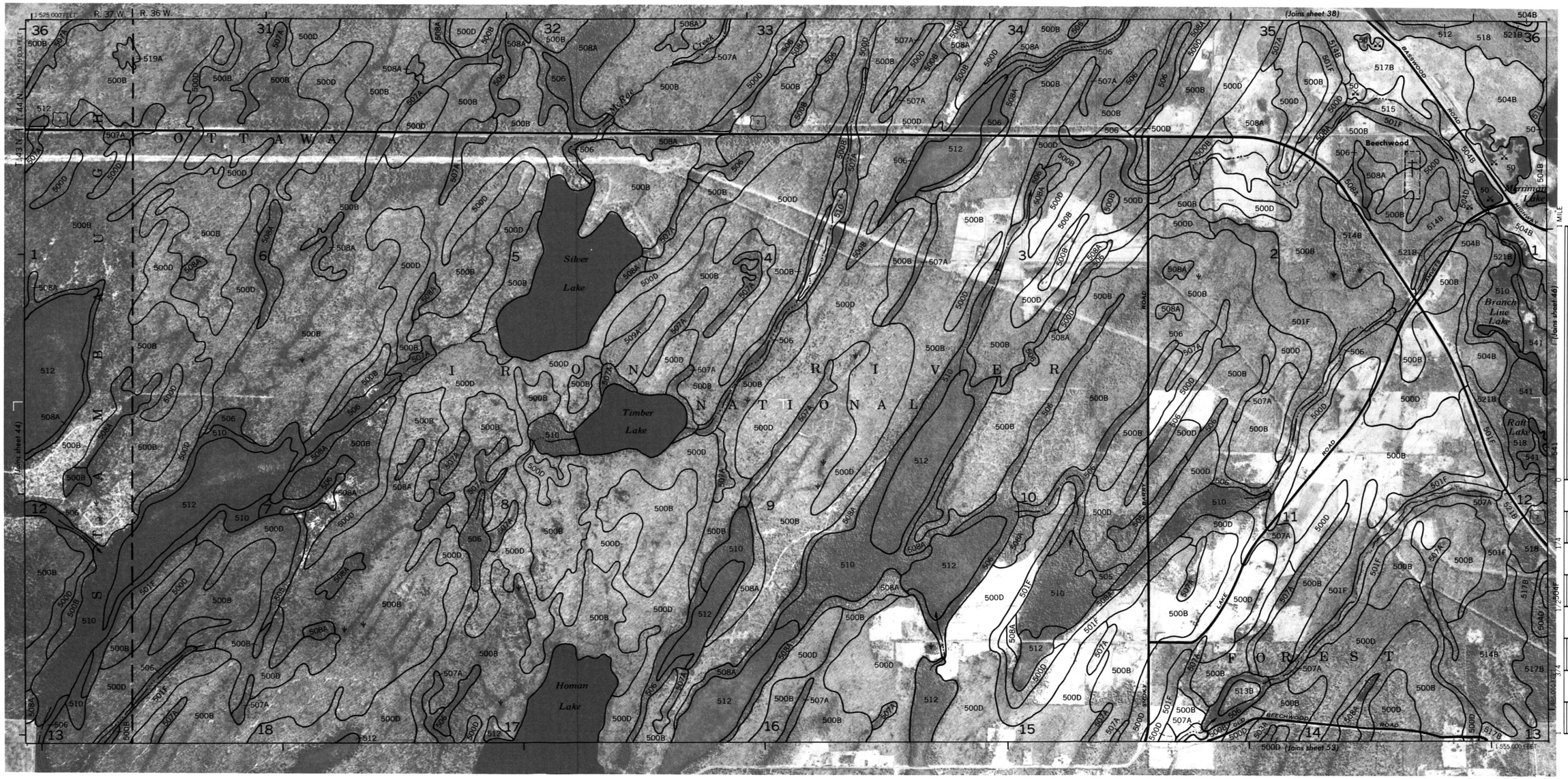
IRON COUNTY, MICHIGAN NO. 43

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



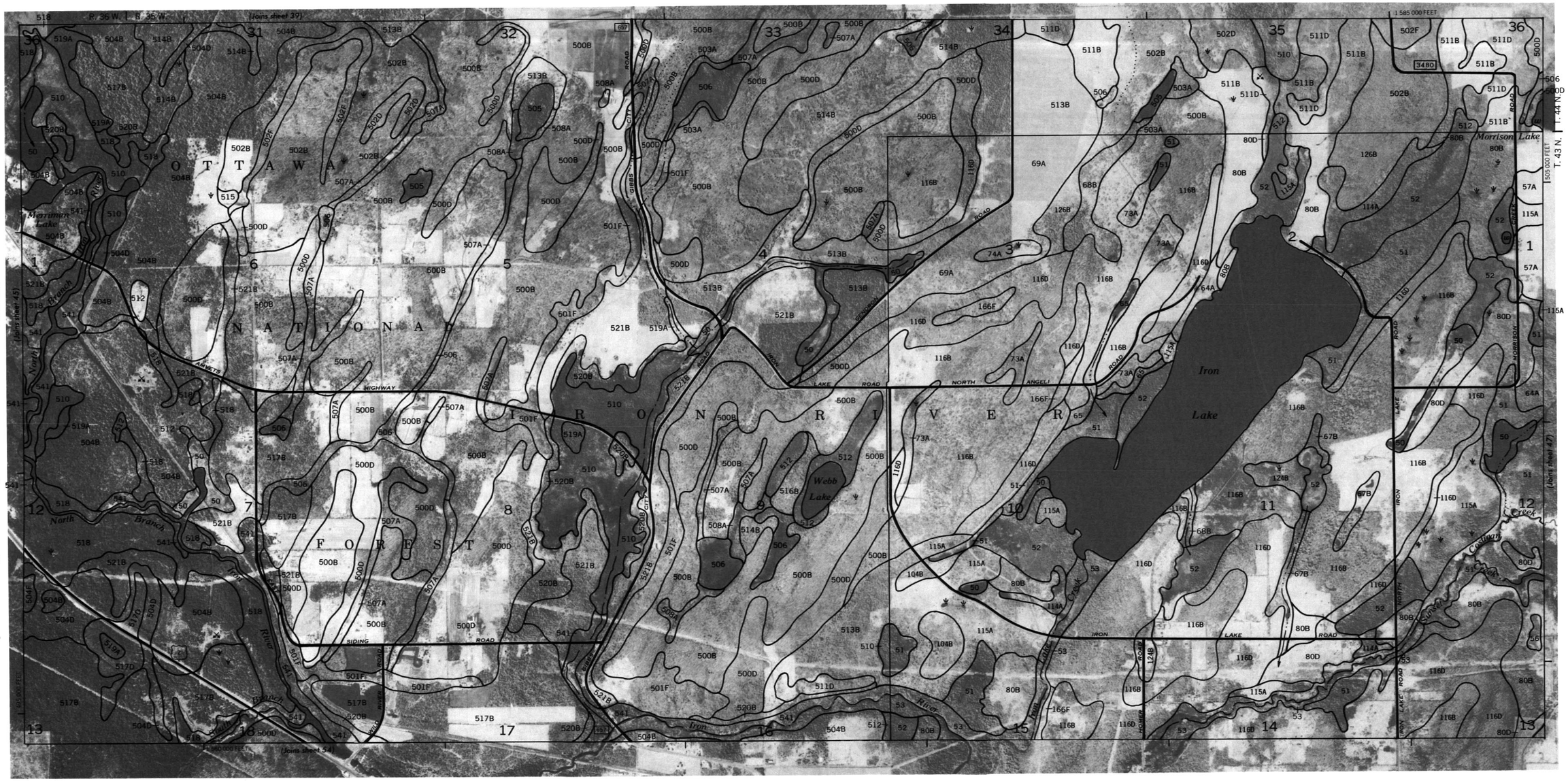
IRON COUNTY, MICHIGAN NO. 44

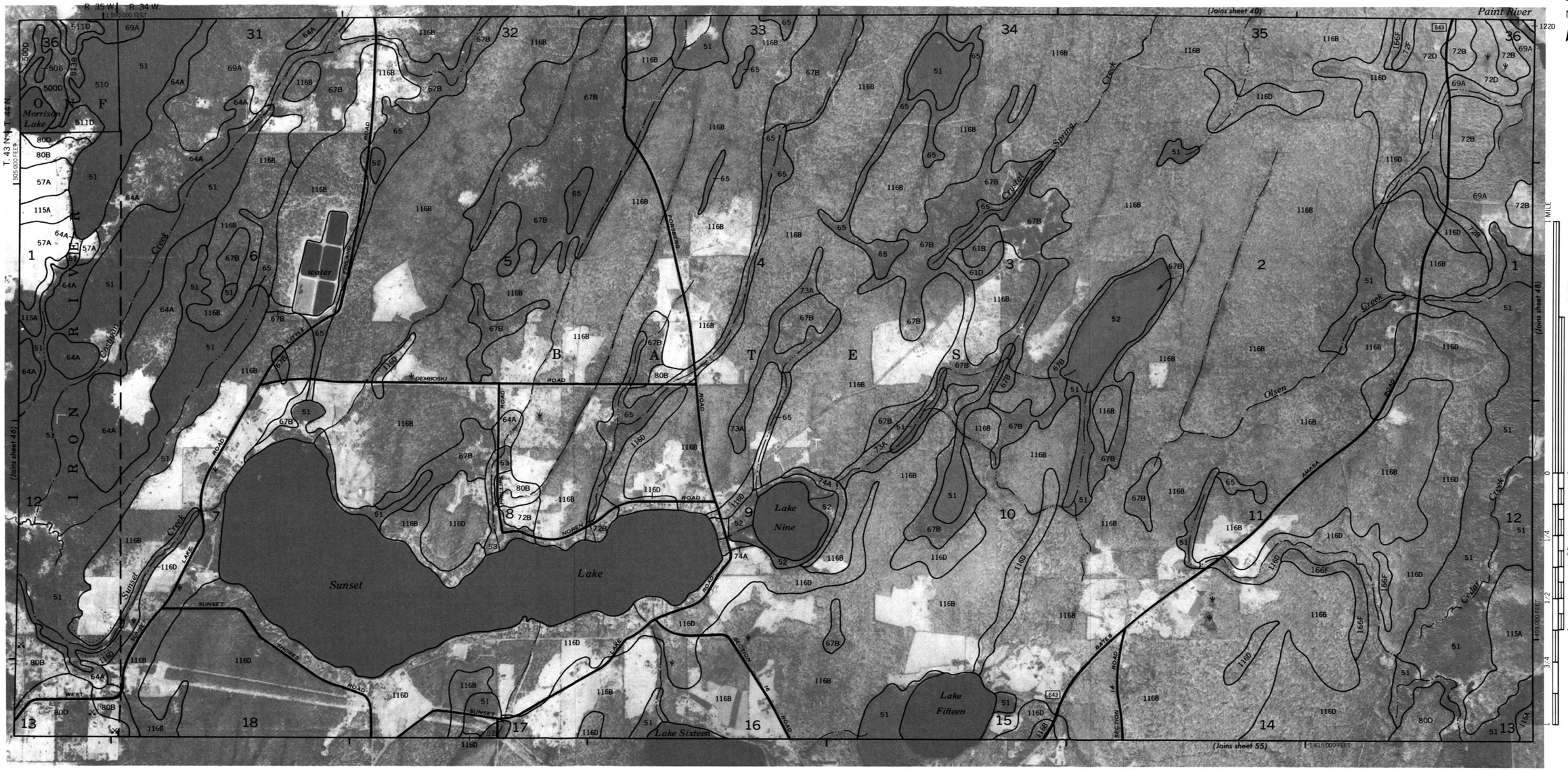
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 45

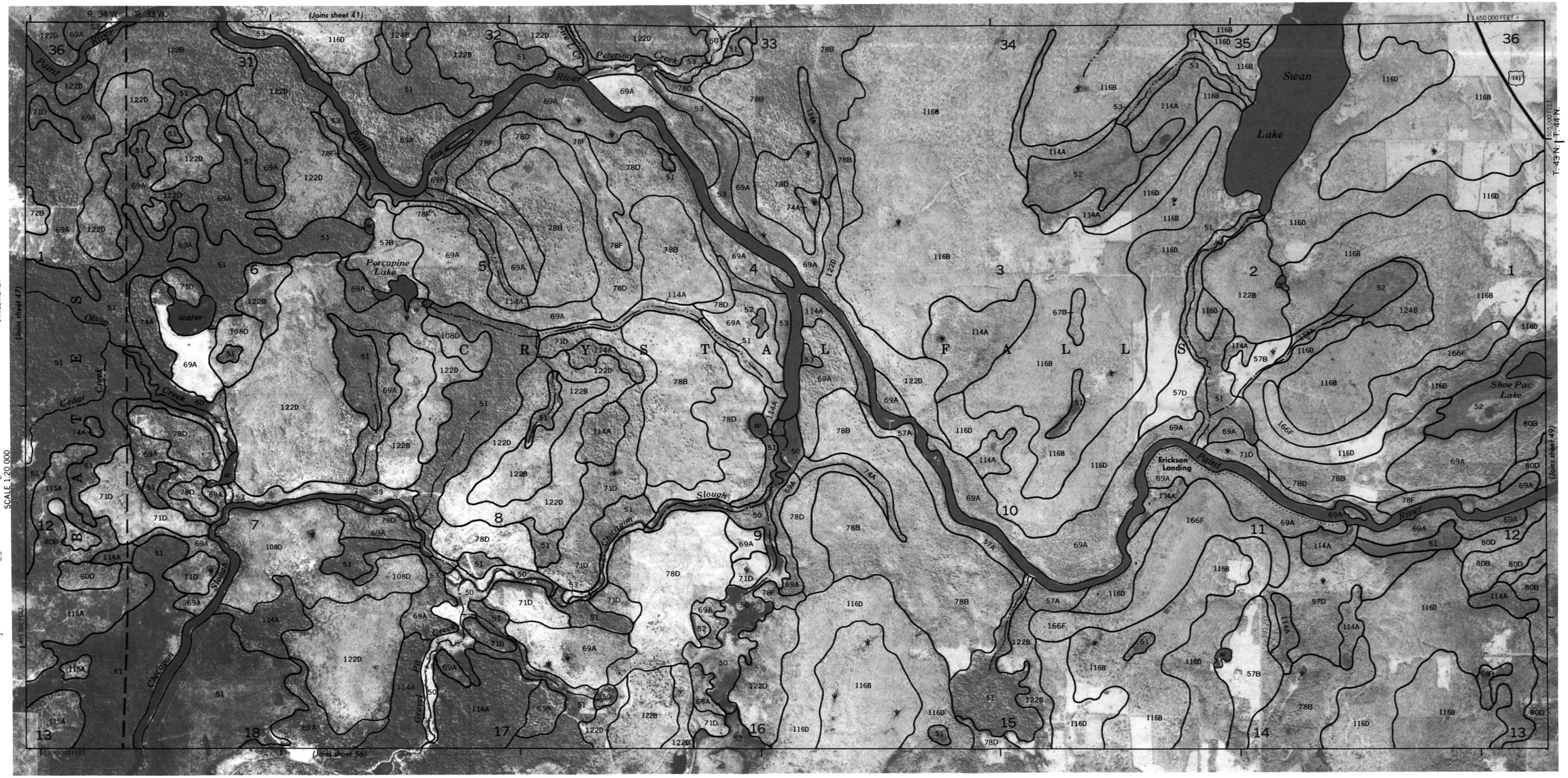
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
R. 36 W.
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(Joins sheet 47)
T. 44 N.
T. 43 N.
1 585 000 FEET
505 000 FEET
1 MILE
1 KILOMETER
OTTAWA
NATIONAL
FOREST
IRON RIVER
Iron Lake
Webb Lake
Morrison Lake
Merriman Lake
North Branch
Iron River
Cushman Creek
Indian Creek
Stevens Creek
Gibbs Creek
Morrison Creek
Iron Lake Creek
Hamlets Creek
Gibbs City Road
Iron Lake Road
North Lake Road
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Iron Lake Road
Angeli Road
Siding Road
Highway M-73
Highway M-189
Highway M-424
Highway M-424
Highway M-424



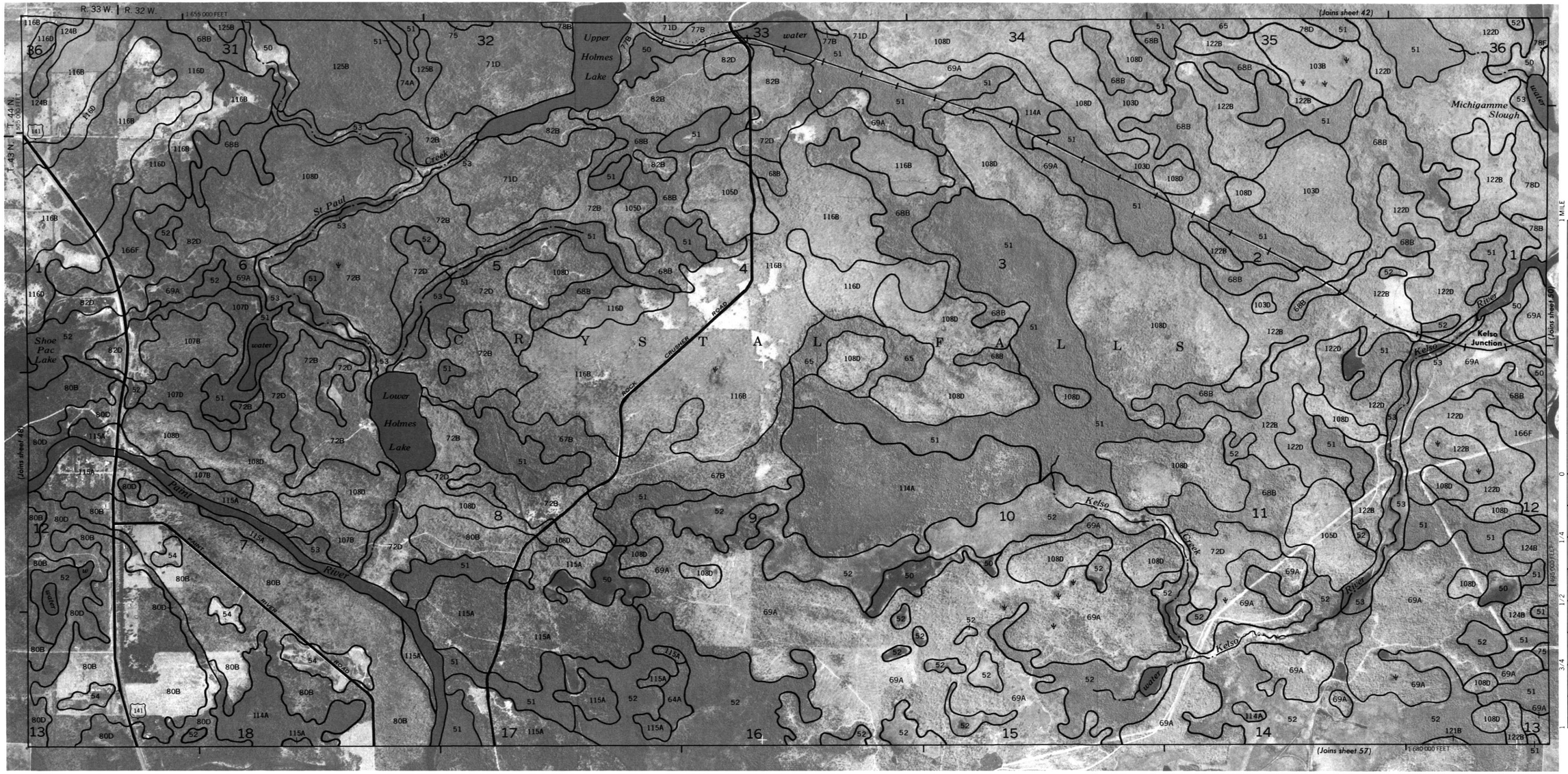
IRON COUNTY, MICHIGAN NO. 47

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



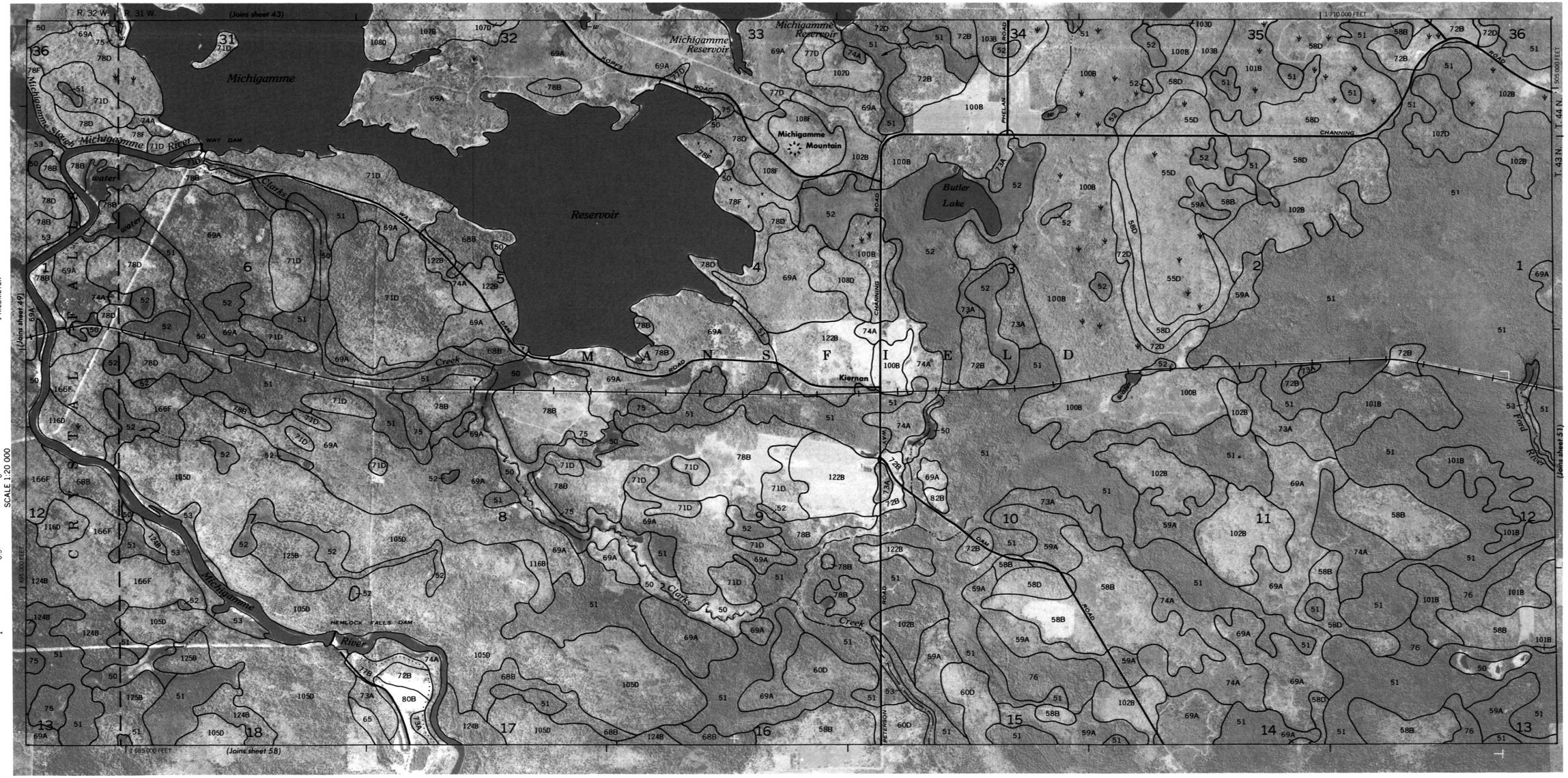
IRON COUNTY, MICHIGAN NO. 48

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 49

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



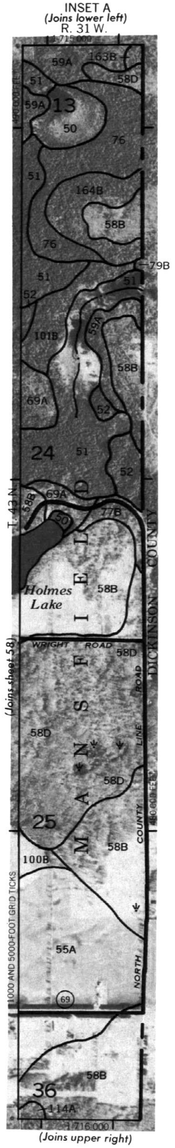
IRON COUNTY, MICHIGAN NO. 50

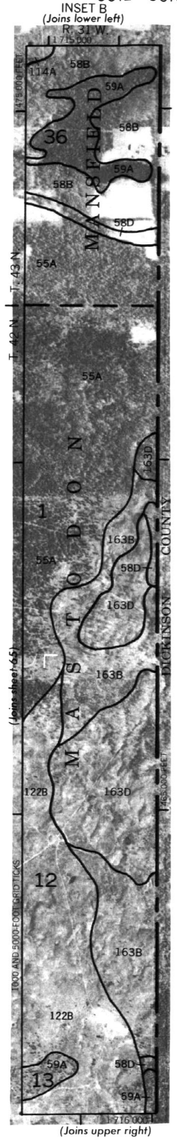
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

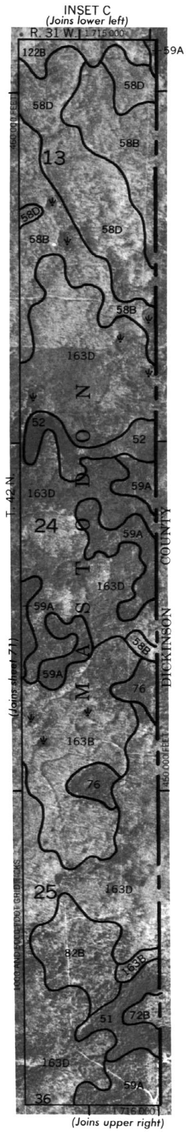
IRON COUNTY, MICHIGAN NO. 51

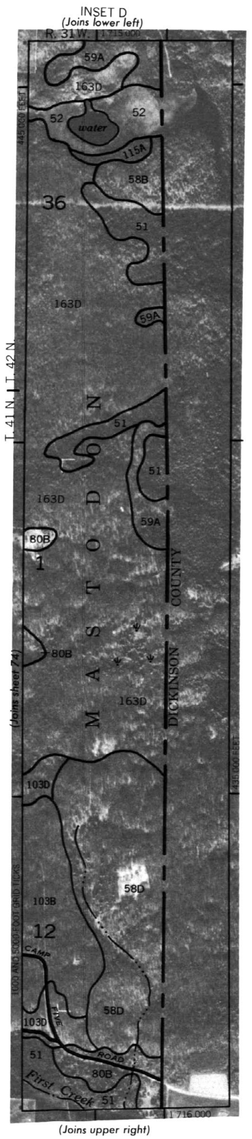
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

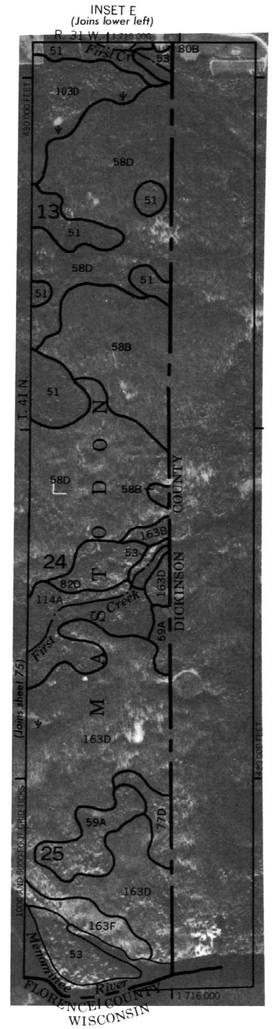


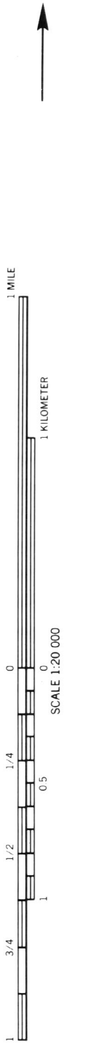








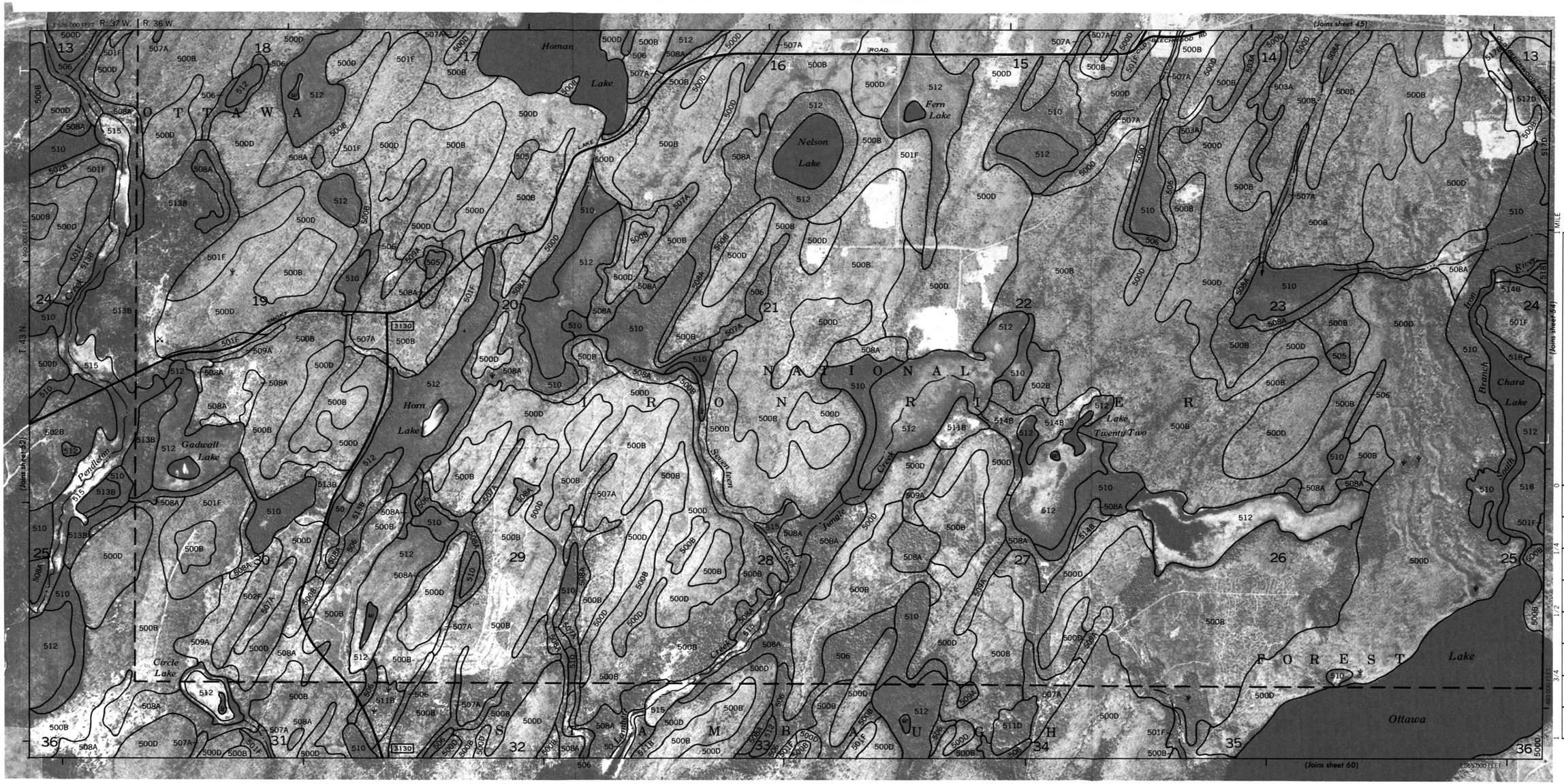






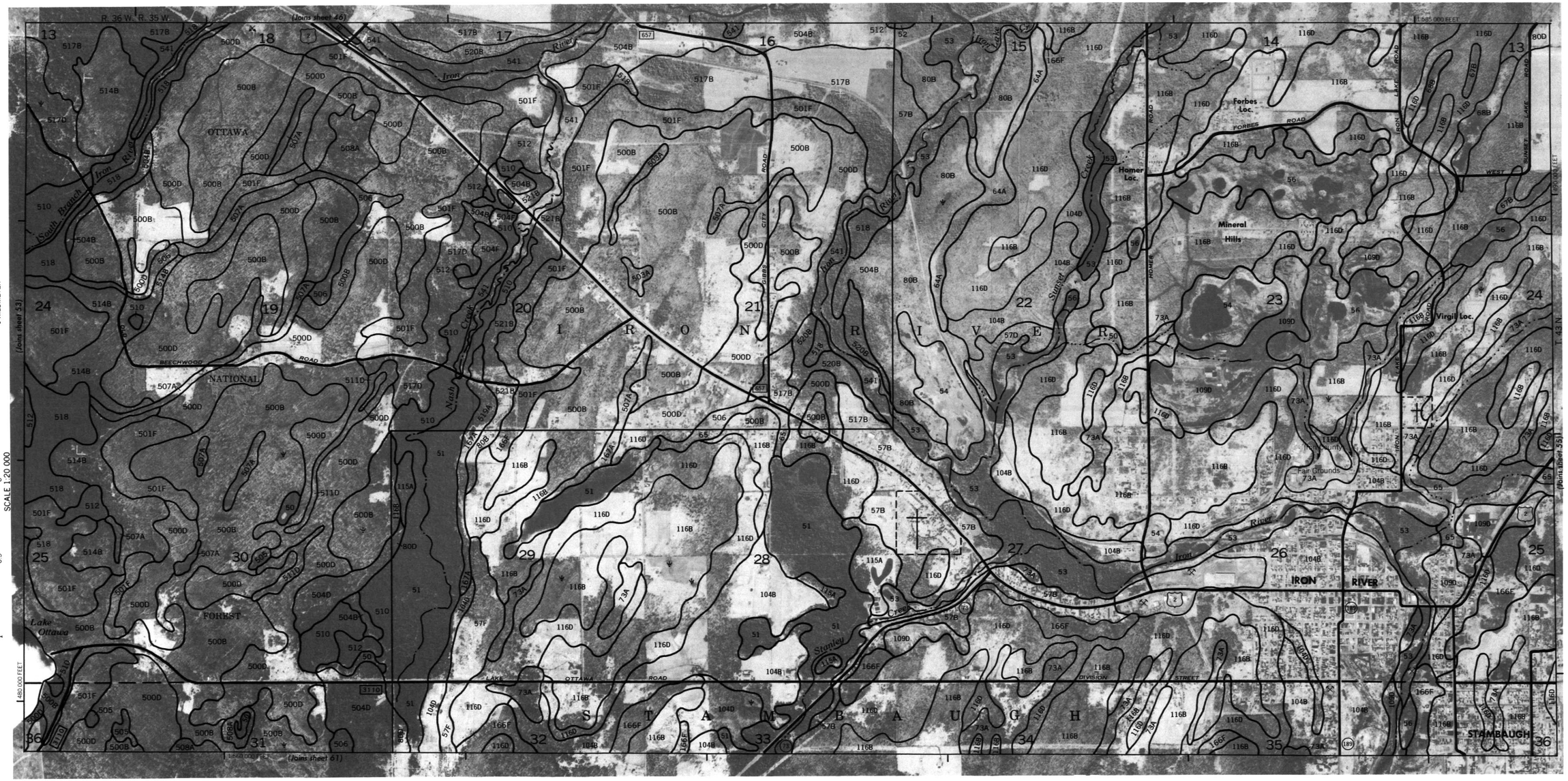
IRON COUNTY, MICHIGAN NO. 52

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



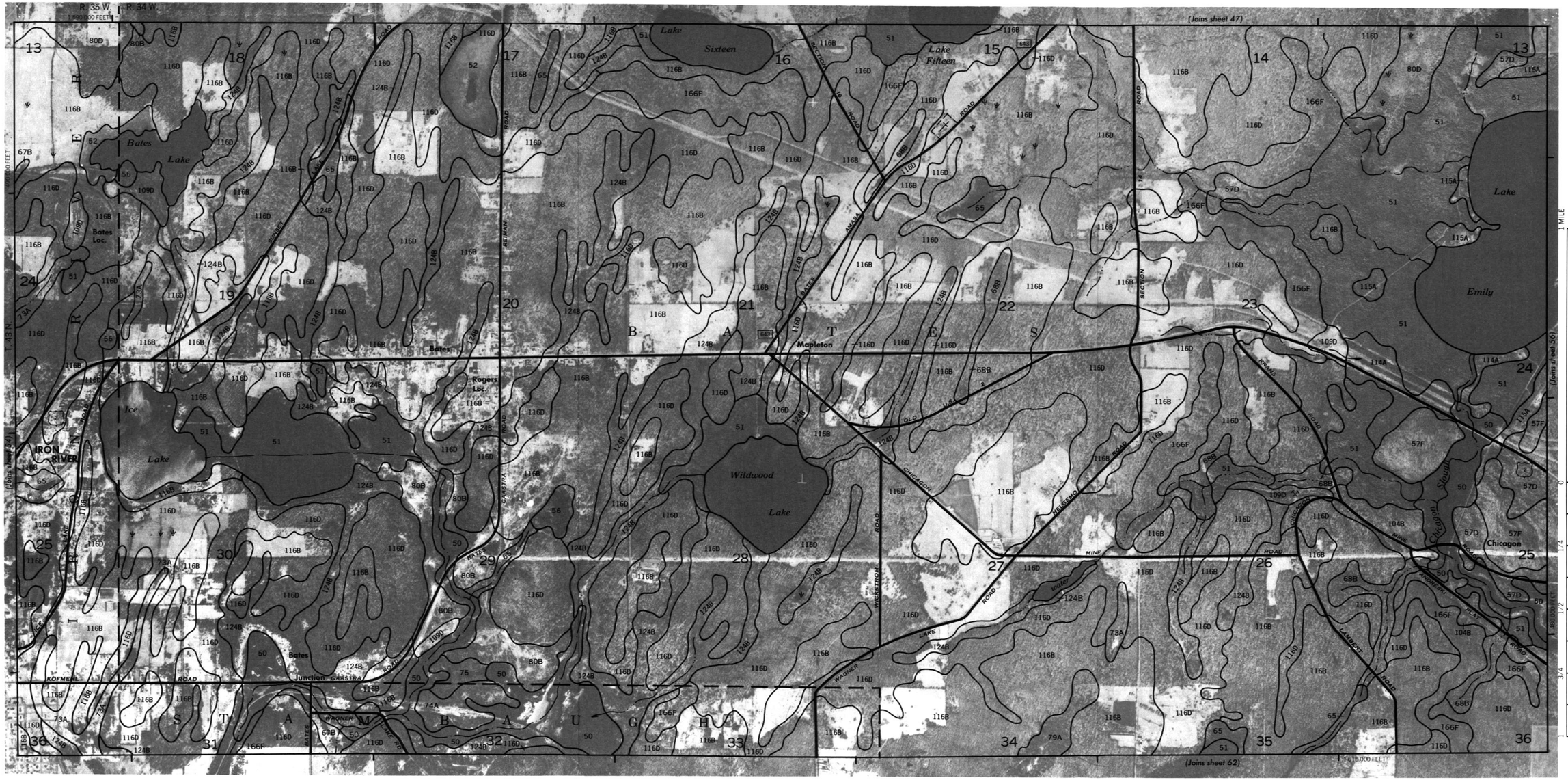
IRON COUNTY, MICHIGAN NO. 53

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



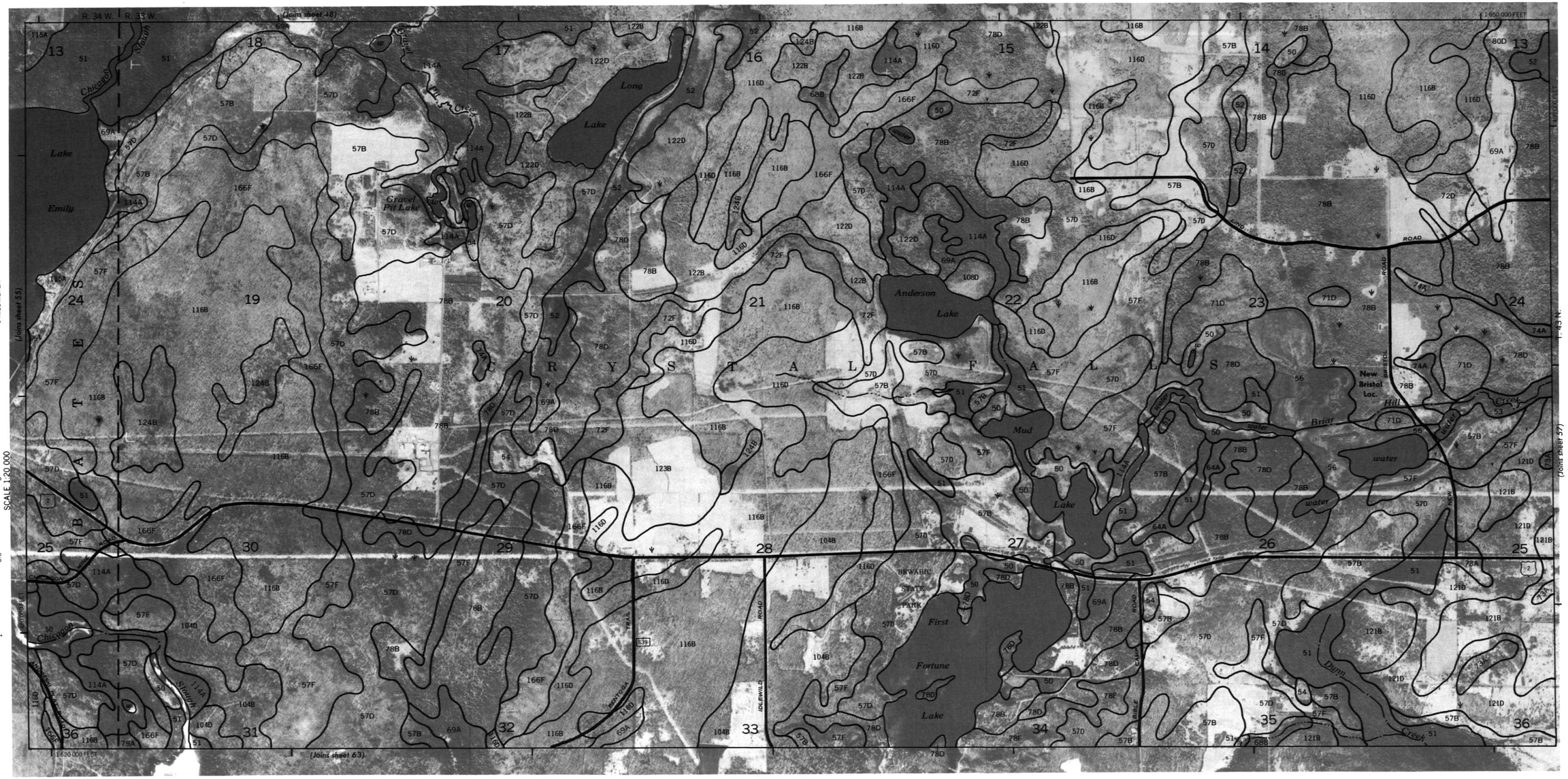
IRON COUNTY, MICHIGAN NO. 54

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 55

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



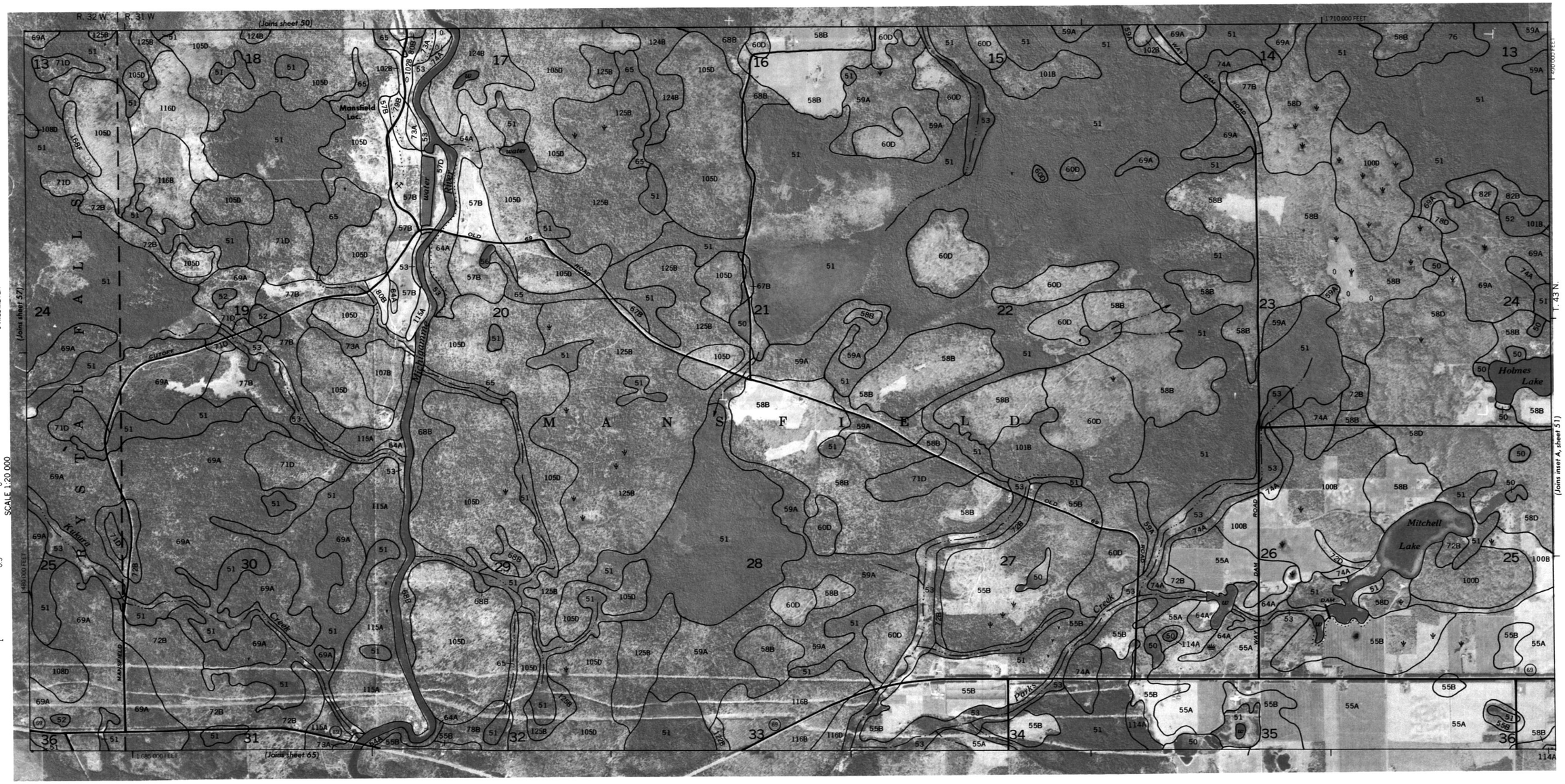
IRON COUNTY, MICHIGAN NO. 56

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



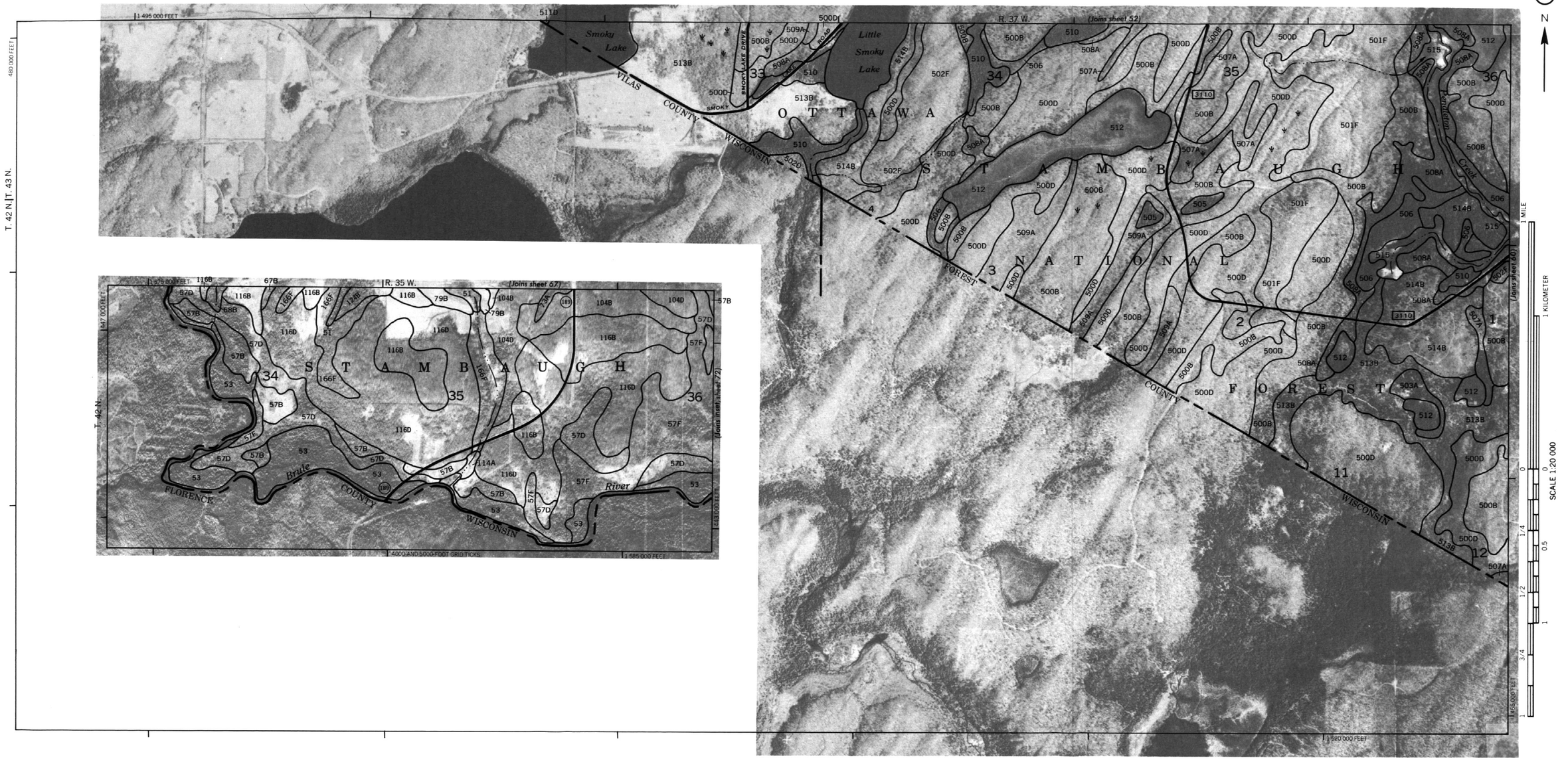
IRON COUNTY, MICHIGAN NO. 57

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



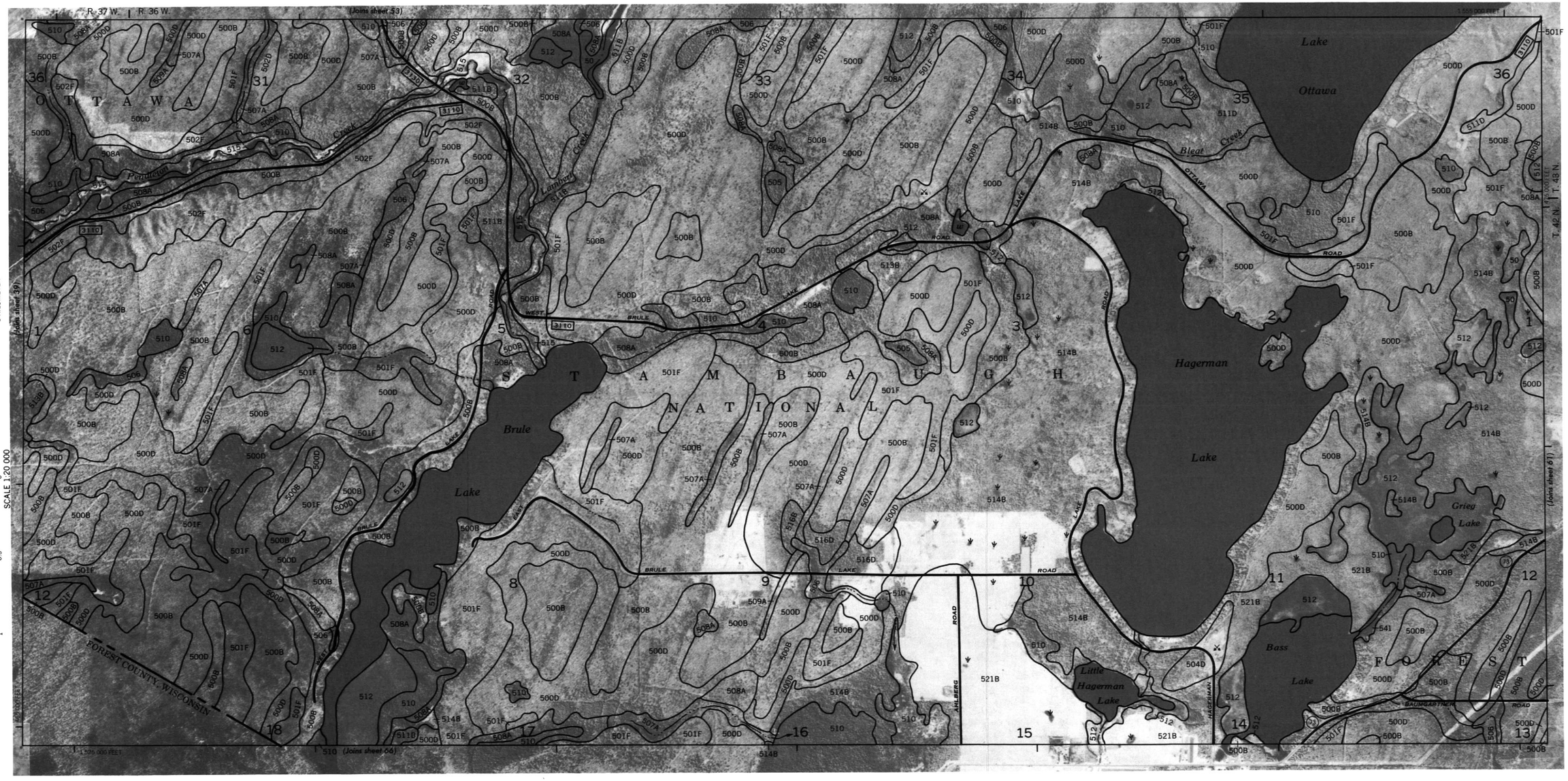
IRON COUNTY, MICHIGAN NO. 58

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



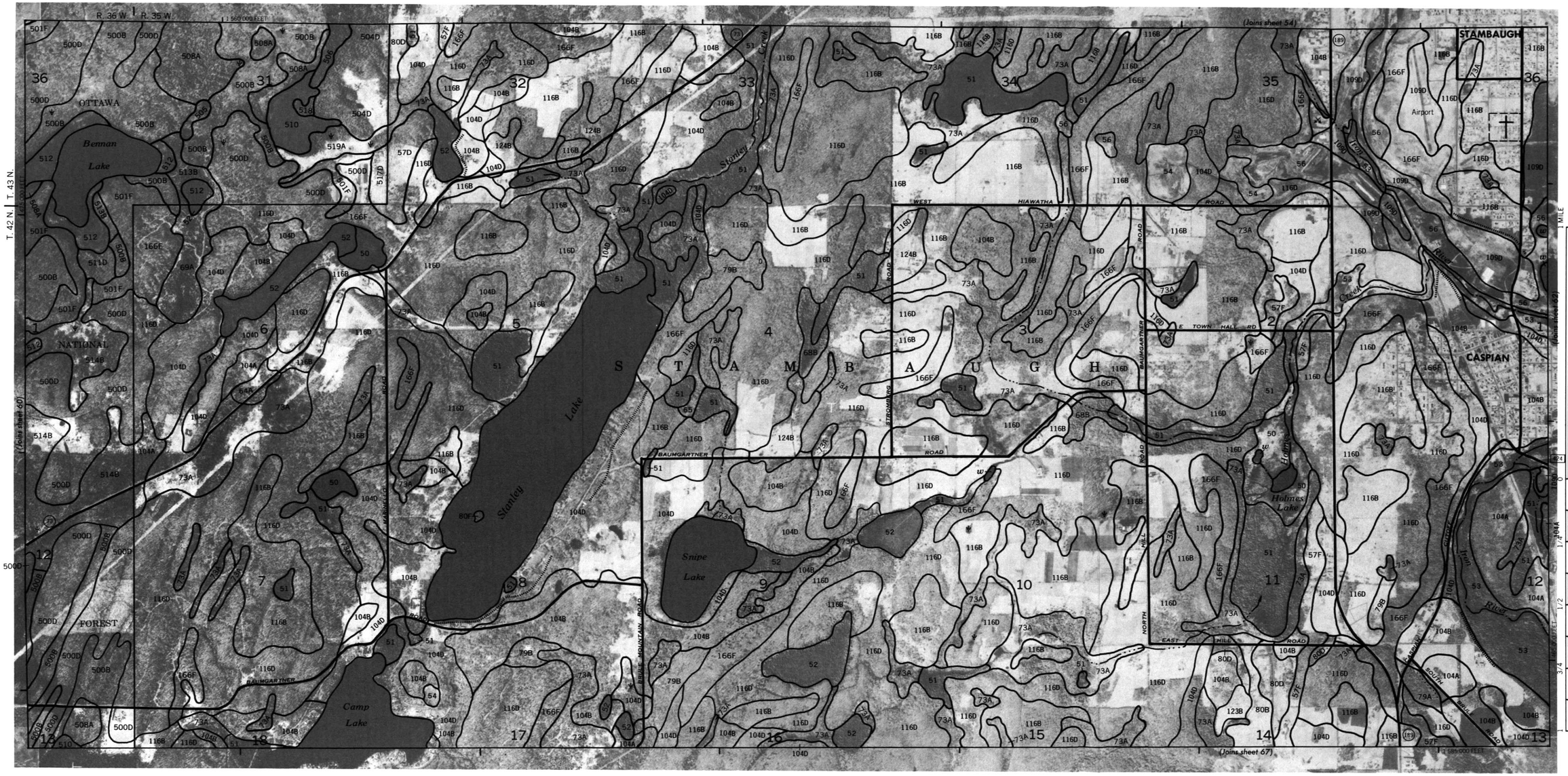
IRON COUNTY, MICHIGAN NO. 59

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



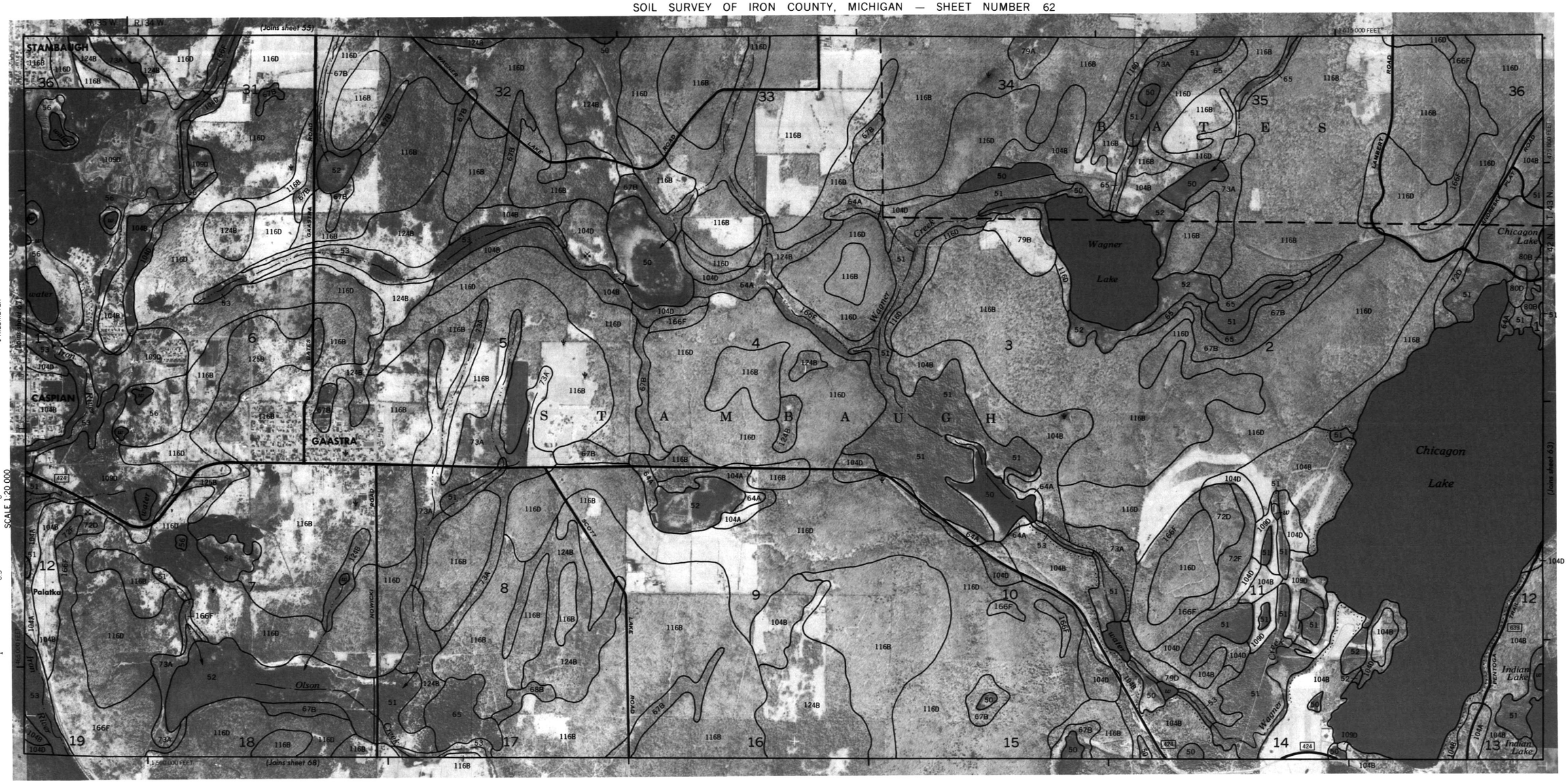
IRON COUNTY, MICHIGAN NO. 60

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



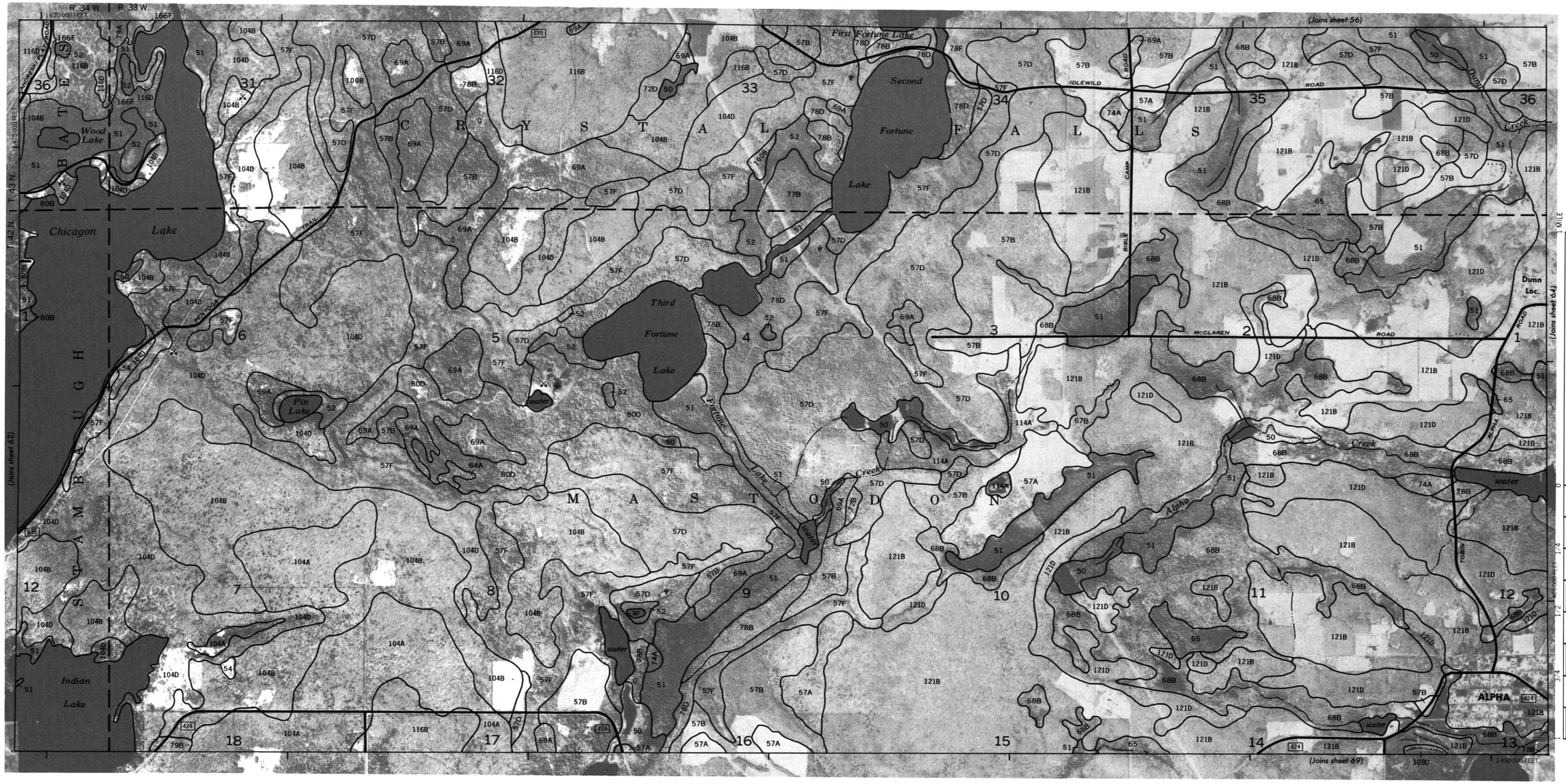
IRON COUNTY, MICHIGAN NO. 61

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 62

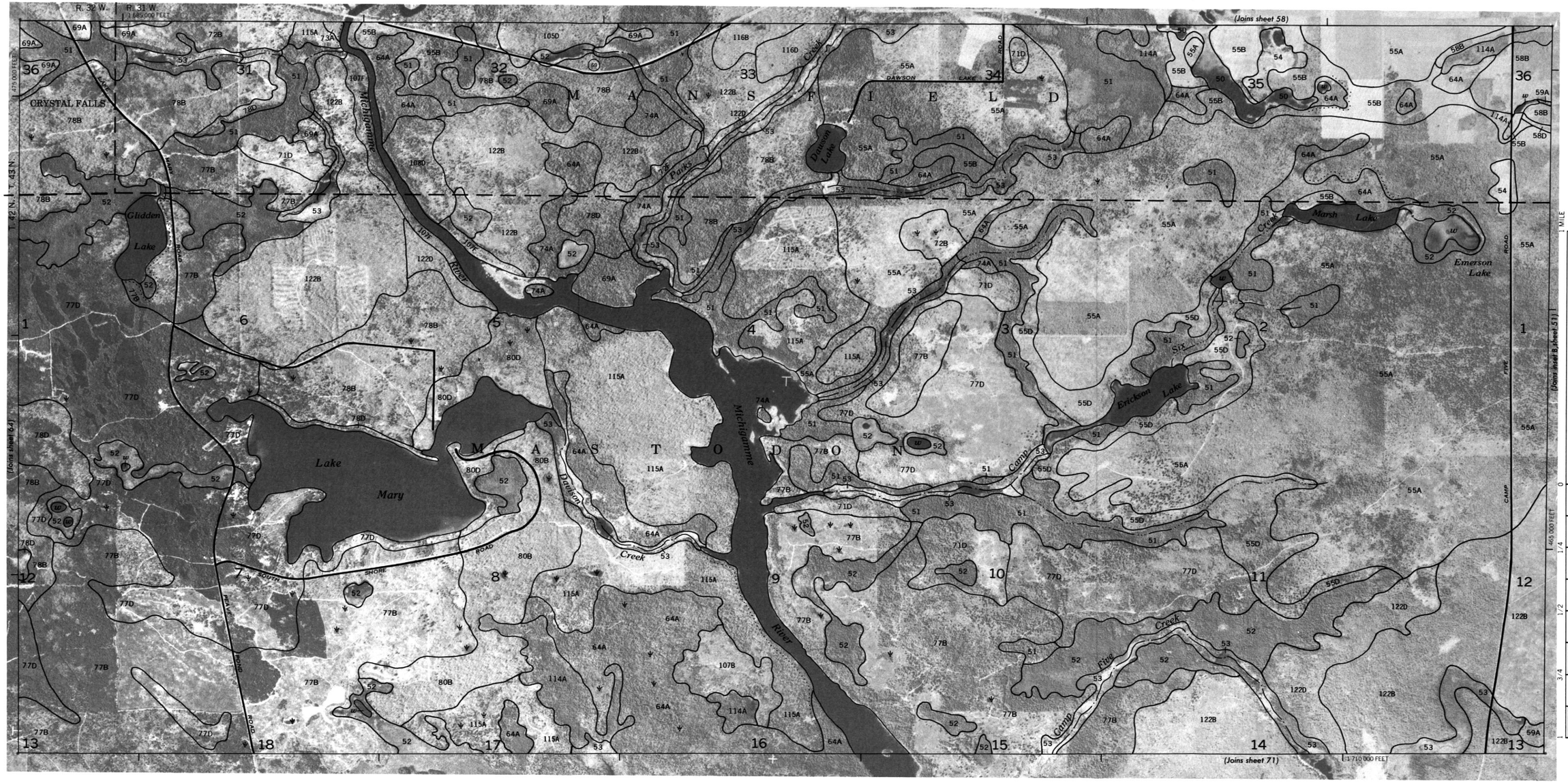
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 63

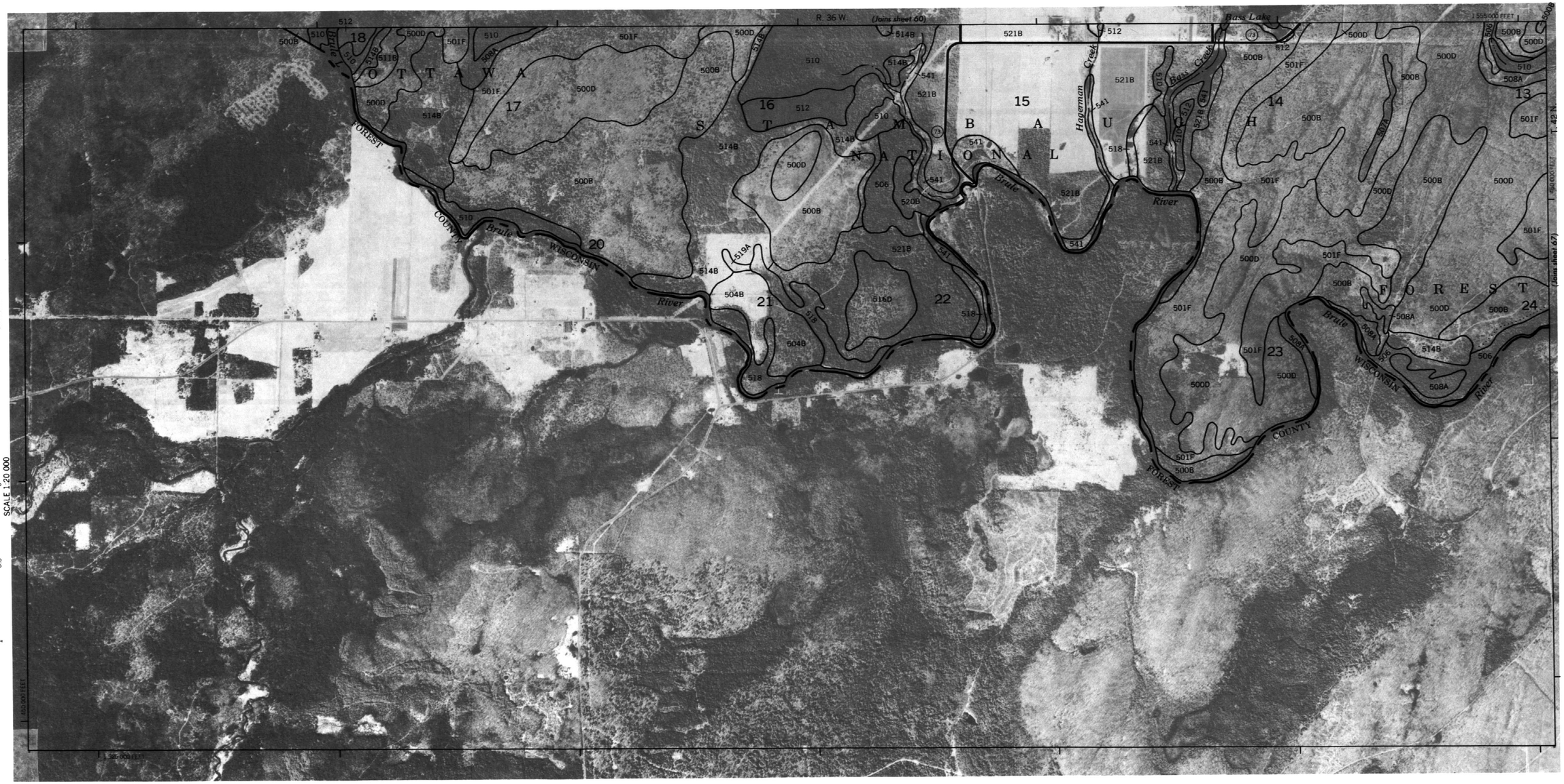
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


R. 33 W.
R. 32 W.
(Joins sheet 57)
1 680 000 FEET
478 000 FEET
T. 42 N.
T. 43 N.
(Joins sheet 63)
(Joins sheet 65)
(Joins sheet 70)
N
1 MILE
1 KILOMETER
SCALE 1:20 000
0
0.5
1
1/4
1/2
3/4
1
965 000 FEET
1 685 000 FEET
C R Y S T A L
F A L L S
M A S T O D O N
Dunn Loc.
Railroad
Lake
Paint
River
Mud Lake
Little Mud Lake
Tim Bowers Pond
Panola
ALPHA
Alpha
Creek
Dunn
Creek
Water Works
Creek
Water
Creek
Paint
River
Little
Paint
River
Water
Creek
Water
Creek
Water
Creek



IRON COUNTY, MICHIGAN NO. 65

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N
SCALE 1:20 000
1 MILE
1 KILOMETER
0
0.5
1
1/4
1/2
3/4
1
R. 36 W.
(Joins sheet 60)
T. 42 N.
(Joins sheet 67)
T 555 000 FEET
T 450 000 FEET
T 345 000 FEET
TOWAWA
TOWNSHIP
BALSAM
TOWNSHIP
FOREST
COUNTY
FOREST
Brule
River
WISCONSIN
Hagerman Creek
Bass Creek
Bass Lake
Brule
River
WISCONSIN
River
COUNTY
FOREST
Brule
River
17
16
15
14
13
18
20
21
22
23
24
500B
500D
501F
510
512
514B
521B
541
500B
500D
501F
510
512
514B
521B
541
500B
500D
501F
510
512
514B
521B
541



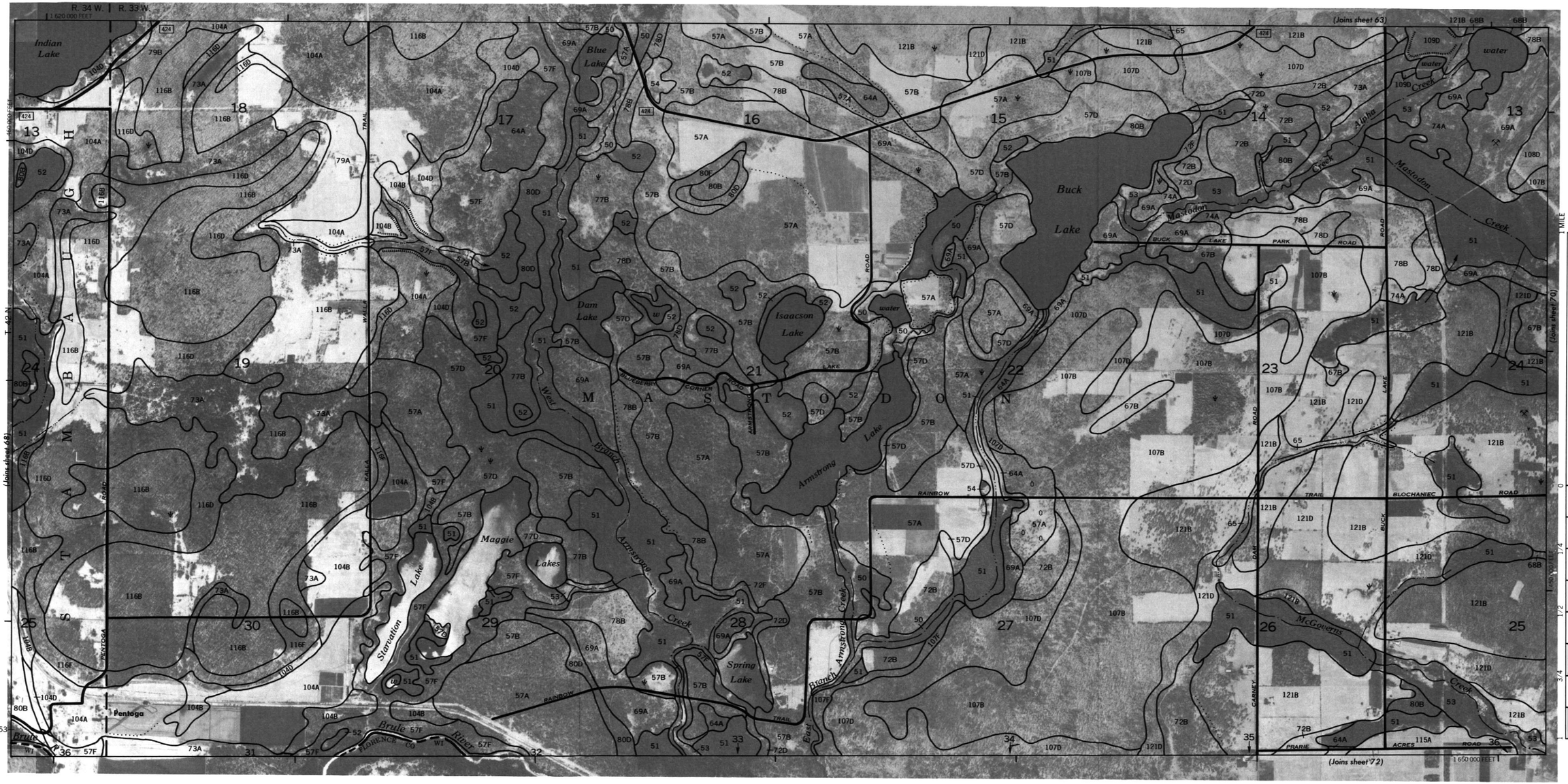
IRON COUNTY, MICHIGAN NO. 67

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



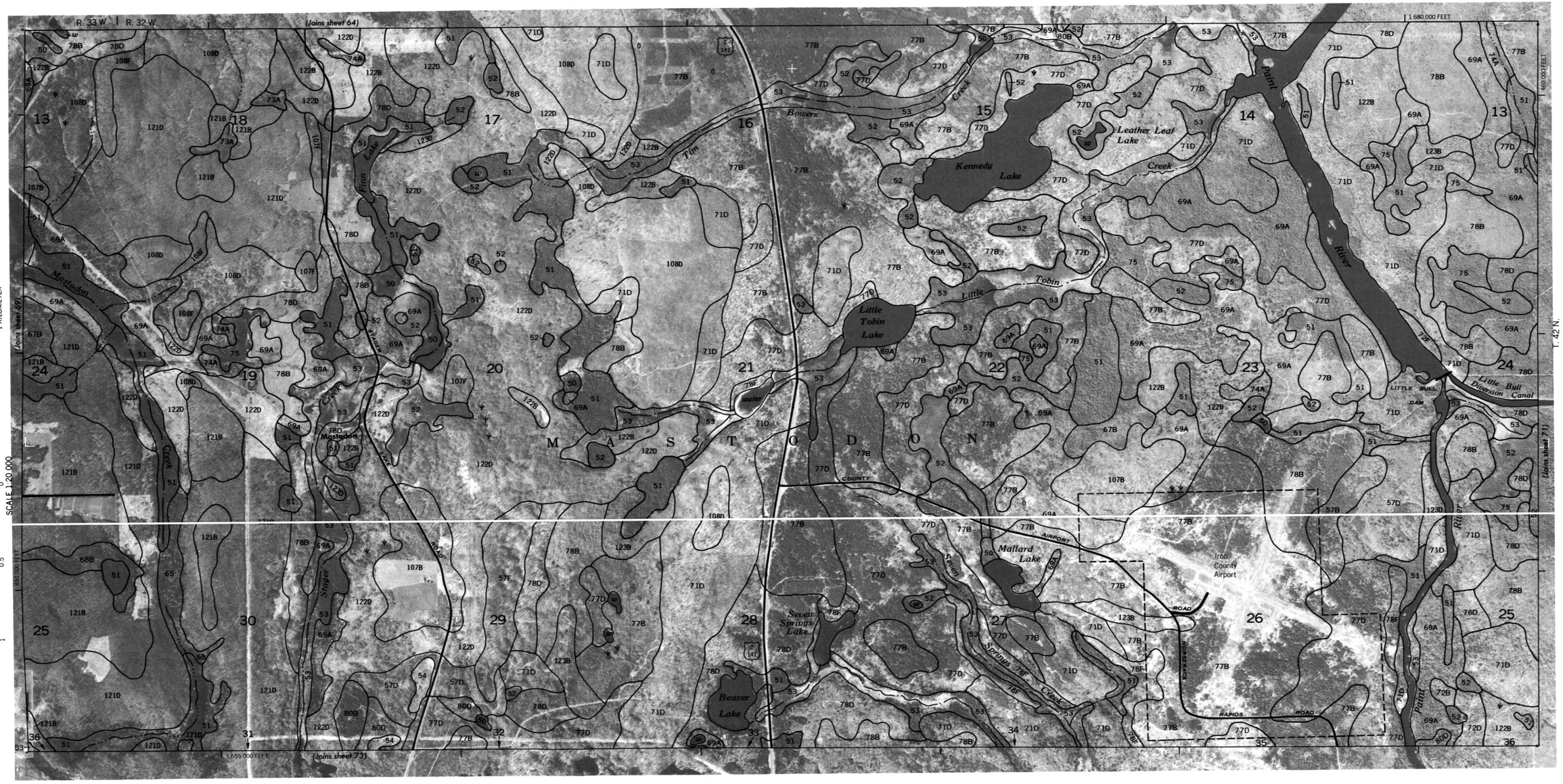
IRON COUNTY, MICHIGAN NO. 68

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 69

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

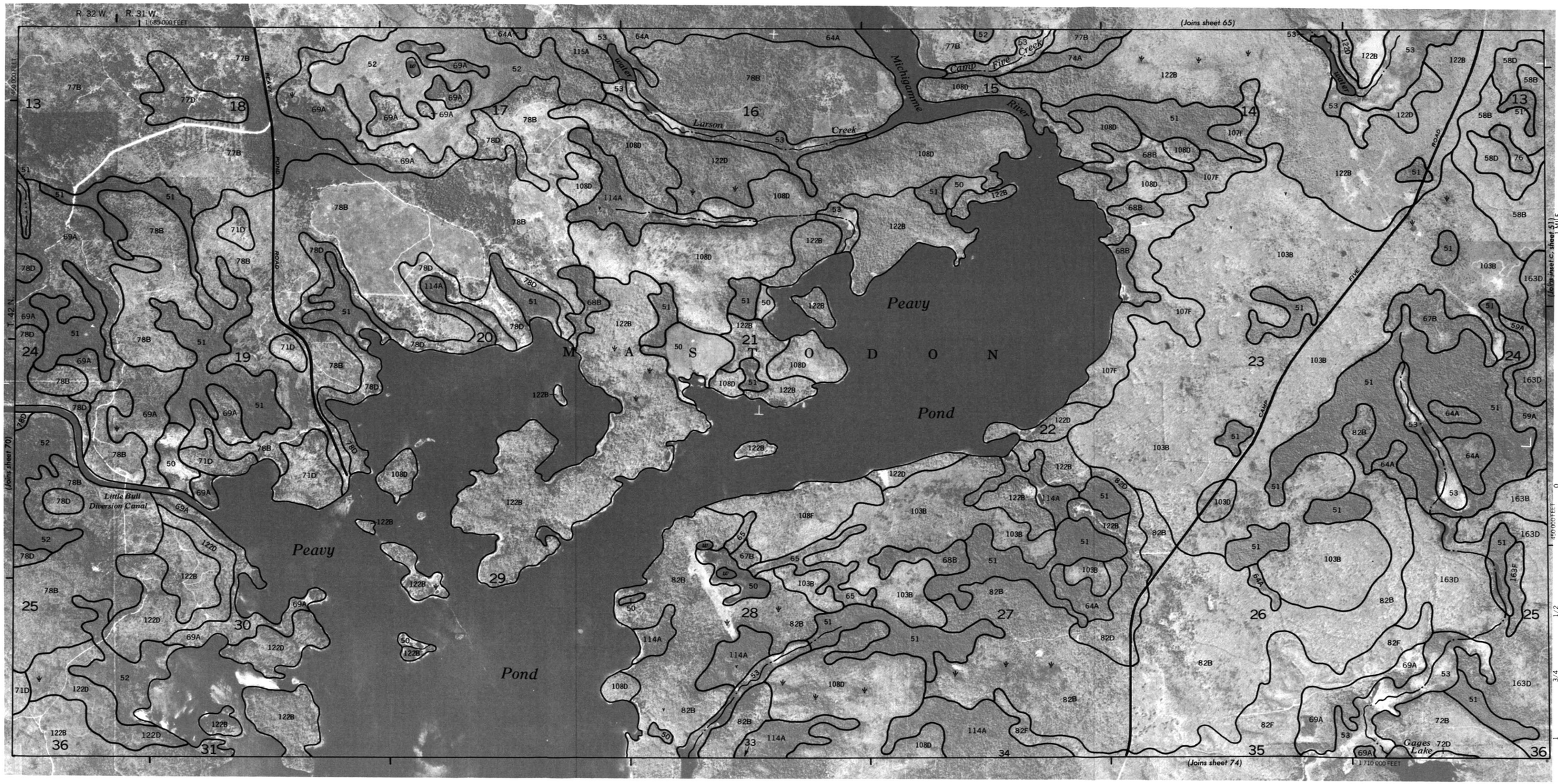


SCALE 1:20 000

1 MILE
1 KILOMETER

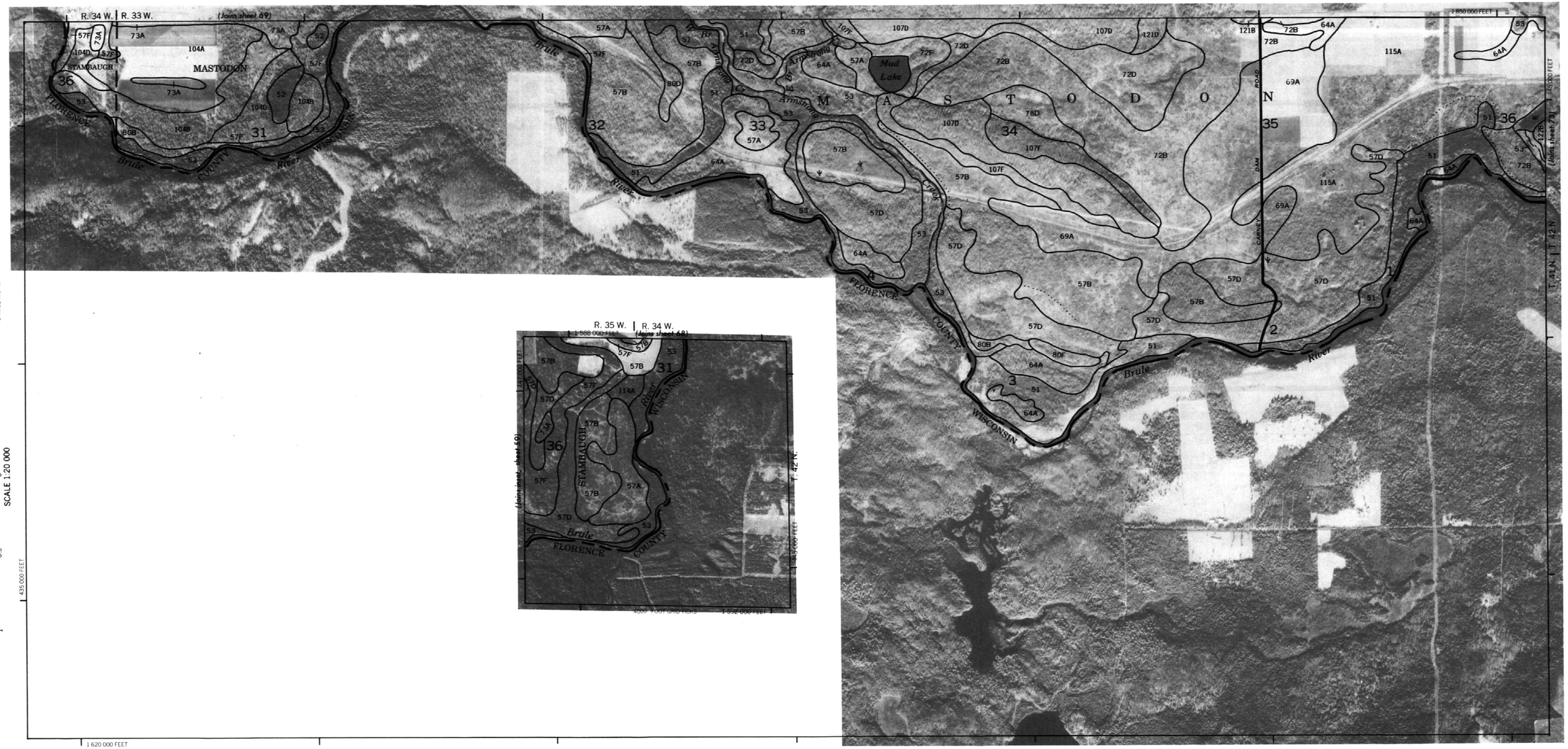
IRON COUNTY, MICHIGAN NO. 70

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1:84 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



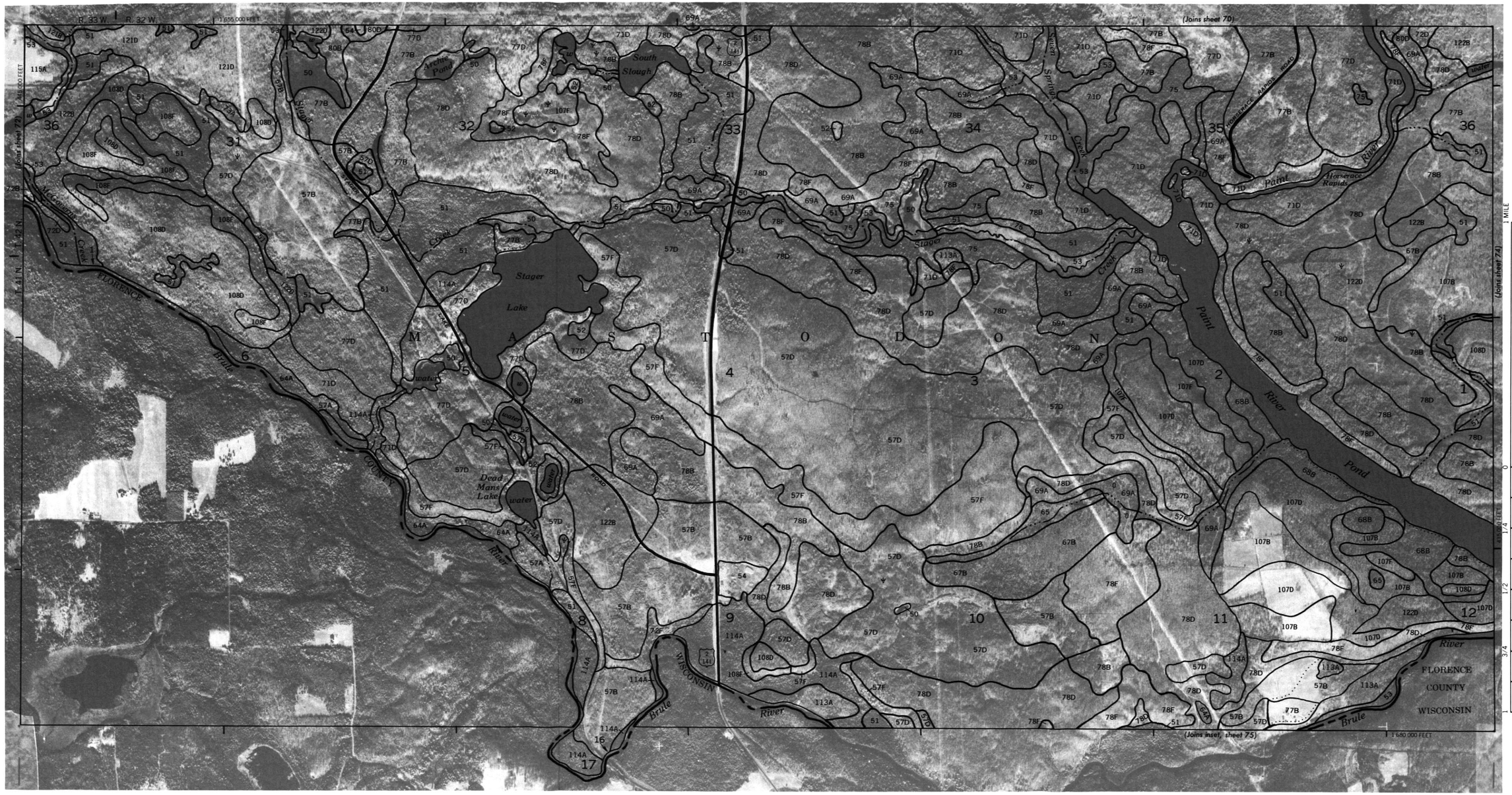
IRON COUNTY, MICHIGAN NO. 71

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



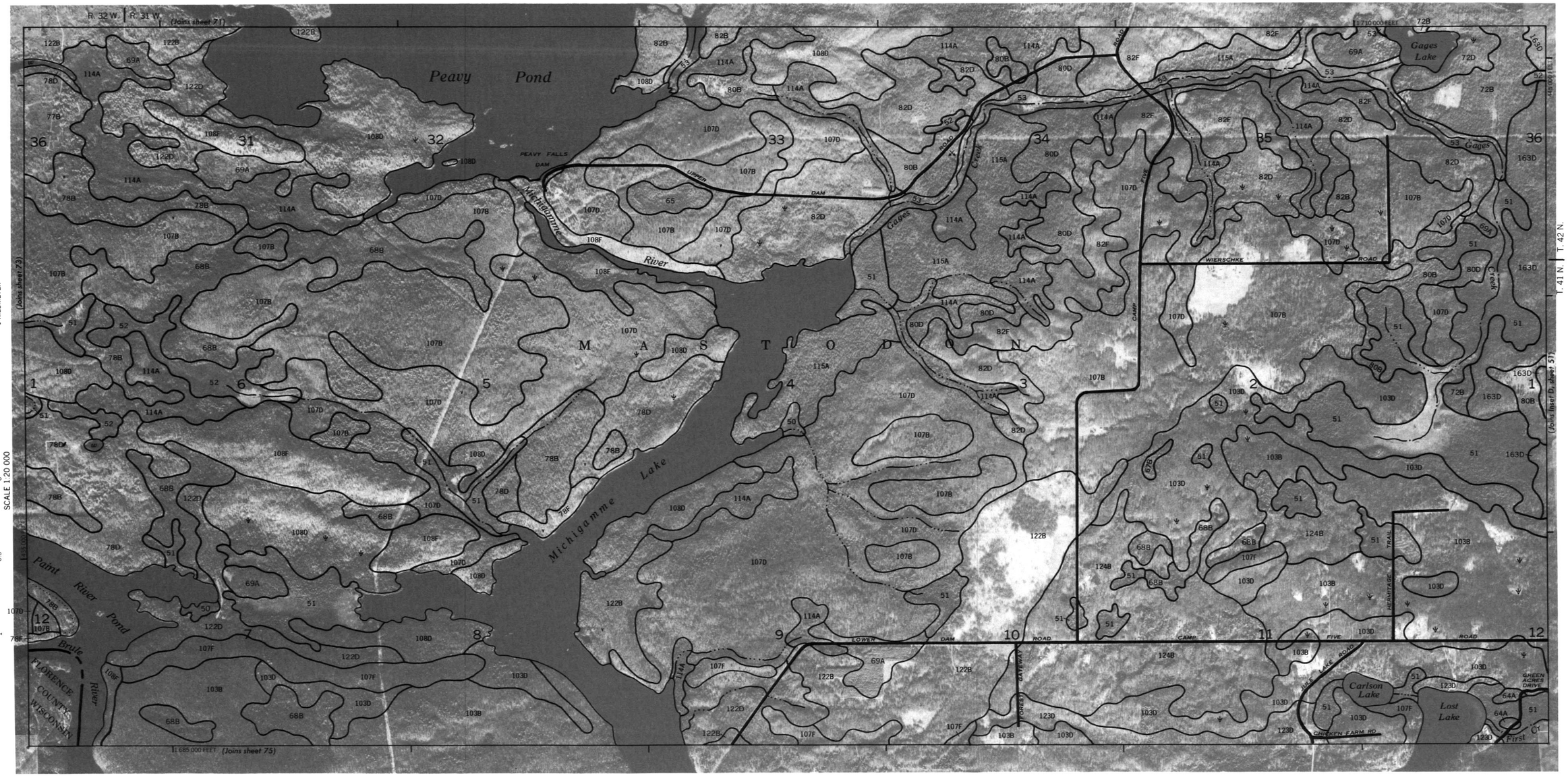
IRON COUNTY, MICHIGAN NO. 72

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 73

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



IRON COUNTY, MICHIGAN NO. 74

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 – 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IRON COUNTY, MICHIGAN NO. 75

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1980 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

